DECEMBER
1959

FOUNDRY

A PENTON PUBLICATION

The Engineering Approach to Cast Parts
Page 60

A New Slant on an Economy Car Engine
Page 65

The Role of Castings in Modern Design
Page 68

The Gating of Copper Alloy Castings
Page 72

A New Approach to Fluidity Testing
Page 79

CONTENTS — Pages 3-4

ONLY MAGCOBAR HAS ALL FOUR

perfect harmony in your foundry operations

Magcobar
AGRICULTURAL AND INDUSTRIAL PRODUCTS

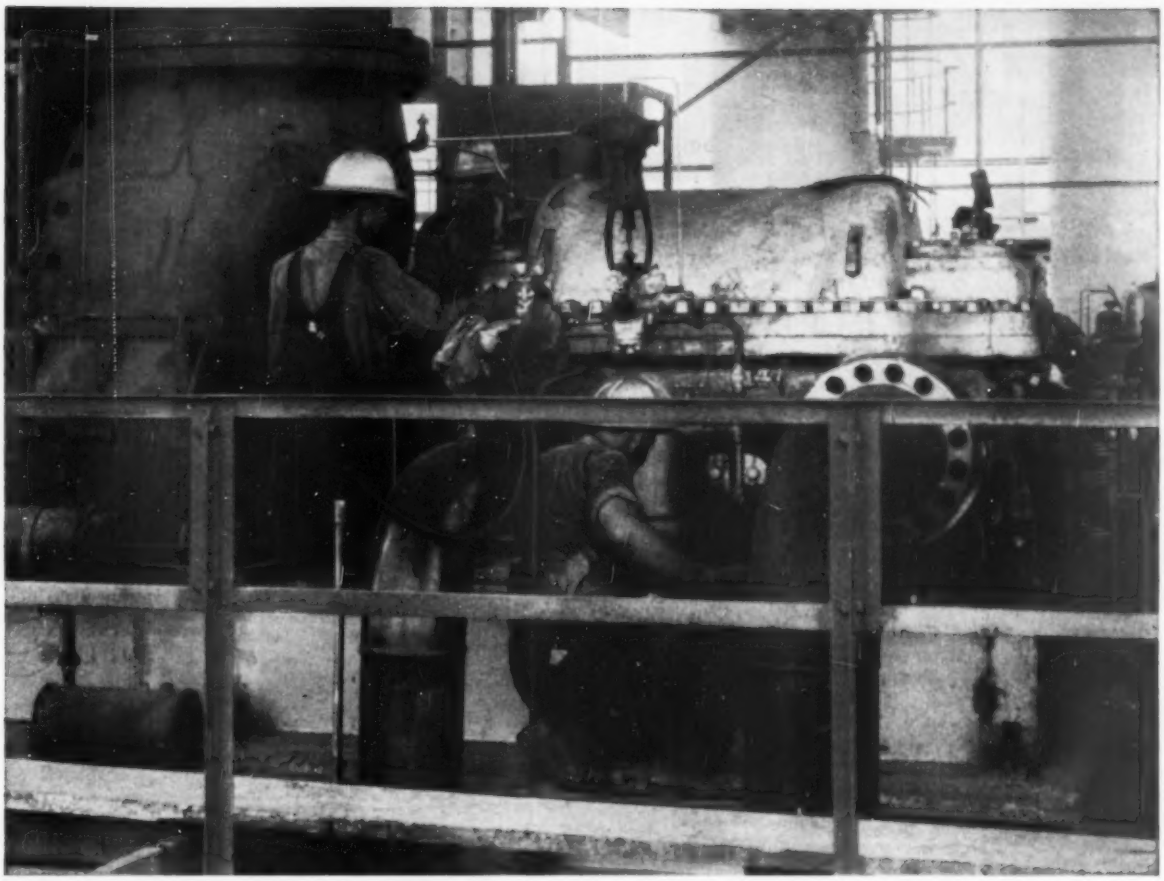
YELLOWSTONE, Western Bentonite
AUTO BOND, Bentonite for Gray Iron
SOUTHERN STAR, Southern Bentonite
and **MAGCOBAR SERVICE.**

MAGNET COVE BARIUM CORP.

HOUSTON, TEXAS
P. O. Box 6504

DES PLAINES, ILL.
576 Northwest Hwy.

Circle 551 on Page 53



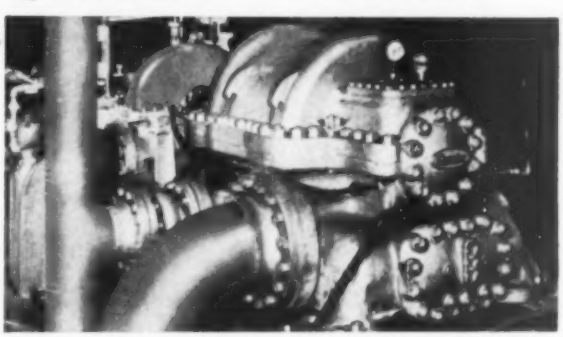
Ethylene compressor being installed at refinery of leading oil company for operation at 600 psi, as low as −185°F. Compressor halves are cast from 4½% nickel steel to meet notch toughness requirements at the operating temperature.

Cast 4½% nickel alloy steel ethylene compressor, works at −185°F

Temperatures down to −185°F . . . pressures up to 600 pounds per square inch . . . mean greater efficiency for this ethylene compressor. But these extreme operating conditions increase the danger of low temperature embrittlement. To protect the compressor against cracking, Carrier Corporation of Syracuse, N. Y., specifies cover and base in 4½% Nickel, low carbon steel . . . an alloy with remarkable impact strength at "deep frozen" temperatures.

"Specialty" castings like these can be especially profitable to the foundry; they are good for you because they are good for your customer. This is another example of how Nickel gives you, first, – a wide range of alloys to offer, alloys suitable for many special applications . . . gives you, second, – improved control over the melting casting, heat treating and machining behavior of the castings themselves.

Look into nickel-containing cast alloys. Write . . .



Closeup of #350 Carrier compressor, similar to unit shown above. 4½% nickel steel cast upper half weighs 4200 lb, lower half, 5800 lb.

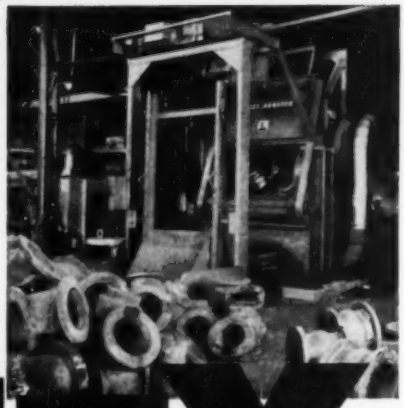
THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL MAKES ALLOYS PERFORM BETTER LONGER

Circle 554 on Page 53

TOUGH
CLEANING JOBS



THIS LARGE WEST-COAST FOUNDRY cleans 3,400-lb. loads of steel castings in a 28 cu. ft. Super Tumblast, with one-third less labor.

call for the
MIGHTY
SUPER TUMBLAST ®

With tireless cleaning power and super performance features, the Wheelabrator Super Tumblast gives you super cleaning capacity and efficiency. This is no idle claim . . . being field proven in three years of field experience in diversified applications in over 150 plants. The results prove that the Super Tumblast delivers high production, superior cleaning results, exceptional labor savings and unequalled economy.

A HIGH PRODUCTION MALLEABLE FOUNDRY cut cleaning time 70%, saved 20 man-hours daily, and increased cleaning output by replacing two older machines with this Super Tumblast.

A LARGE MID-WESTERN FOUNDRY doubled its cleaning rate with this Super Tumblast. Heavy loads of soil pipe fittings are cleaned in 5-min. blast cycles slashing labor and operating costs in half.

In over 150 installations, the Super Tumblast has demonstrated its ability to handle the really tough cleaning jobs. Get all the facts from Wheelabrator Corporation, 505 South Byrkit Street, Mishawaka, Indiana. In Canada, Wheelabrator Corporation, Canadian Division, P.O. Box 490, Scarborough, Ontario.

WHEELABRATOR
CORPORATION
AIRLESS BLAST
CLEANING EQUIPMENT

Intake manifold for Chrysler Corp.'s Valiant engine is cast of aluminum in this permanent mold. The operator is shown placing an oil-sand core in the mold. For details on this new engine, see article starting on Page 68.

December 1959
Volume 87—Number 12

FOUNDRY
A PENTON PUBLICATION

Make It Clear 59
Editorial—By FRANK G. STEINEBACH

The Engineering Approach to Cast Parts 60
Oberdorfer Foundries Inc. offers customers design, laboratory, and engineering help, a choice of four molding methods, and patternmaking, heat treating, inspection, and machining facilities—By ROBERT H. HERRMANN

Castings' Role in Modern Design 65
Castings offer designers a means of matching shape and form of a part to its task. For many shapes, the casting process is the simple and direct route from metal to functional part

A New Slant on an Economy Car Engine 68
Close co-operation between engine designers and production engineers, plus a background of economy car engine research, permitted quick development of the Chrysler Corp.'s new Valiant engine—By ROBERT H. HERRMANN

Gating Copper Alloy Castings 72
This article is the latest in our gating and risering series. It summarizes current thinking and results of research on the gating of copper alloy castings—By R. W. RUDDLE

A New Test for Fluidity 79
New type of test was developed to deal more specifically than others with the ability of metal to fill a mold. In addition, this test can be applied in the foundry as well as in the laboratory—By V. KONDIC

Investment Shell Process Offers Advantages . . 84
The ceramic investment shell process offers certain advantages in the production of close-tolerance, intricate castings, but it is not expected to replace flask mold techniques—By ROBERT H. HERRMANN

Non-Ferrous Founders' Society Meets 111
By WILLIAM G. GUDE

International Foundry Congress 118
By M. M. HALLETT

Empire State Regional Foundry Conference . . 128
By WILLIAM G. GUDE

Man to Man 133
Short order loose pattern work won't make any foundry rich, but it might be a means of getting new business and increasing the old—By RALPH L. LEE

CONTINUED NEXT PAGE

Editor: FRANK G. STEINEBACH
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Assistant Editors: VIRGINIA C. TAYLOR, VIRGINIA B. HARMS
Art Editor: DON S. CADOT

CONTINUED FROM PAGE 3

Ohio Regional Foundry Conference 136
By EDWIN BREMER and ROBERT H. HERRMANN

NFA Looks at Industrial Relations Problems . . 146
By FRANK G. STEINEBACH

Metal Efficiency in Magnesium Casting 152
Excessive loss of magnesium alloys sometimes occurs in both sand foundries and diecasting plants, even though good techniques are used in melting operations. Here's one plan to minimize metal loss—By FOSTER C. BENNETT

New England Regional Foundry Conference . . 158
By JACK C. MISKE

Purdue Metals Casting Conference 172
By ERLE F. ROSS

FEMA Holds Annual Meeting 182
By WILLIAM G. GUDE

Steel Founders Hold Sales Conferences 186

Michigan Regional Foundry Conference 188
By EDWIN BREMER

Magnesium Association Surveys Markets 202

In Every Issue

Around the Country	178	Literature for Foundrymen	166
Calendar of Meetings	16	Men of Industry	194
Equipment and Supplies	93	News Views	144
Foundry Developments	126	Obituary	206
How To Do It	116	Questions and Answers	88
Industry Briefs	114	Statistics	33
Late News	33	The Shakeout	208
With the Editors	10		

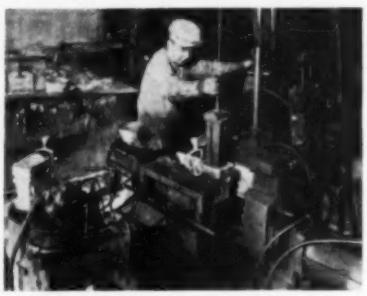
Classified Advertising—213 Advertisers' Index—223 Business Staff—223

EDITORIAL OFFICES: Penton Building, Cleveland 13, Ohio. Main 1-8260. Branch Offices: New York, Detroit, Chicago, Pittsburgh, Washington, London.

FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly and copyright 1959 by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

THE EDITORS' WORKSHOP

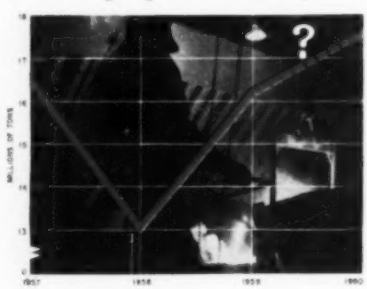
METAL MOLDS: A three-part series coming up will offer a fascinating look at one of the nation's largest, most unusual aluminum jobbing foundries — Monarch Aluminum Mfg. Co., Cleveland. Articles will



describe permanent mold operations, featuring continuous melting and automatic pouring; diecasting production, featuring continuous melting, unit dies, and conveyorized handling; and Monarch's comprehensive approach to marketing.

CASTING WEIGHTS: The Aluminum Foundry Division of the Aluminum Association has just completed an excellent job of compiling methods for computing casting weights from samples, patterns, and blueprints. "How Aluminum Foundries Estimate Casting Weights" will be presented in our January issue.

1960 OUTLOOK: Next month we plan to give you an idea of what the foundry industry thinks of 1960 business prospects. Recently we



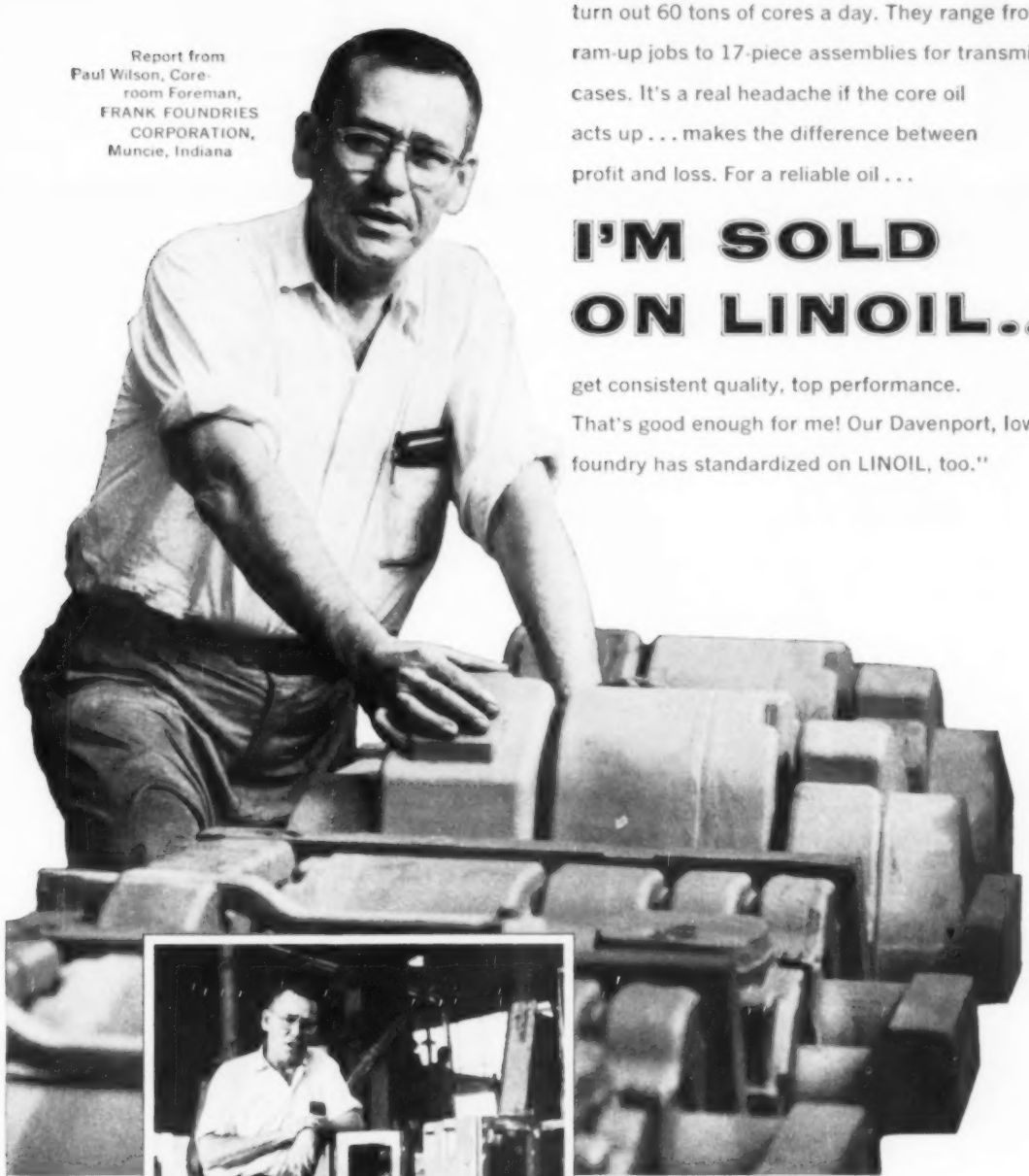
asked many foundries what they look for in the year ahead. Their replies now are being tabulated and will be analyzed in the January issue.

"I run the core room in the Muncie foundry . . . turn out 60 tons of cores a day. They range from little ram-up jobs to 17-piece assemblies for transmission cases. It's a real headache if the core oil acts up . . . makes the difference between profit and loss. For a reliable oil . . .

I'M SOLD ON LINOIL...

get consistent quality, top performance. That's good enough for me! Our Davenport, Iowa, foundry has standardized on LINOIL, too."

Report from
Paul Wilson, Core-room Foreman,
FRANK FOUNDRIES CORPORATION,
Muncie, Indiana



"We can't risk quality on these costly transmission housings. Notice the intricate core work inside . . . reason enough to be fussy about my core oil."

Archer QUALITY

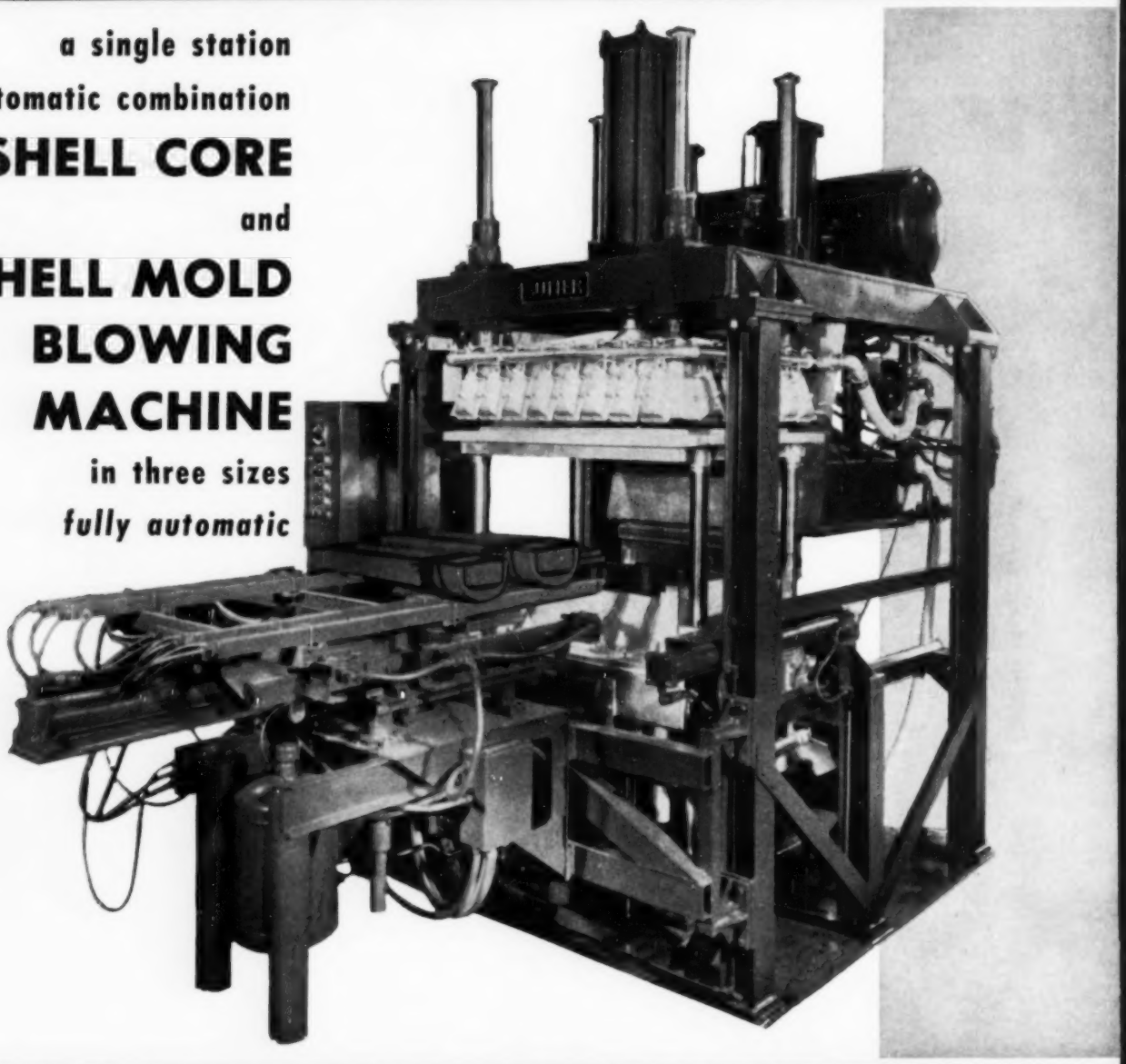
Archer-Daniels-Midland company

FEDERAL FOUNDRY SUPPLY DIVISION • 2191 West 110th Street • Cleveland 2, Ohio

Circle 556 on Page 53

World's Largest Manufacturer of
Shell Mold & Core Making Equipment
Presents:

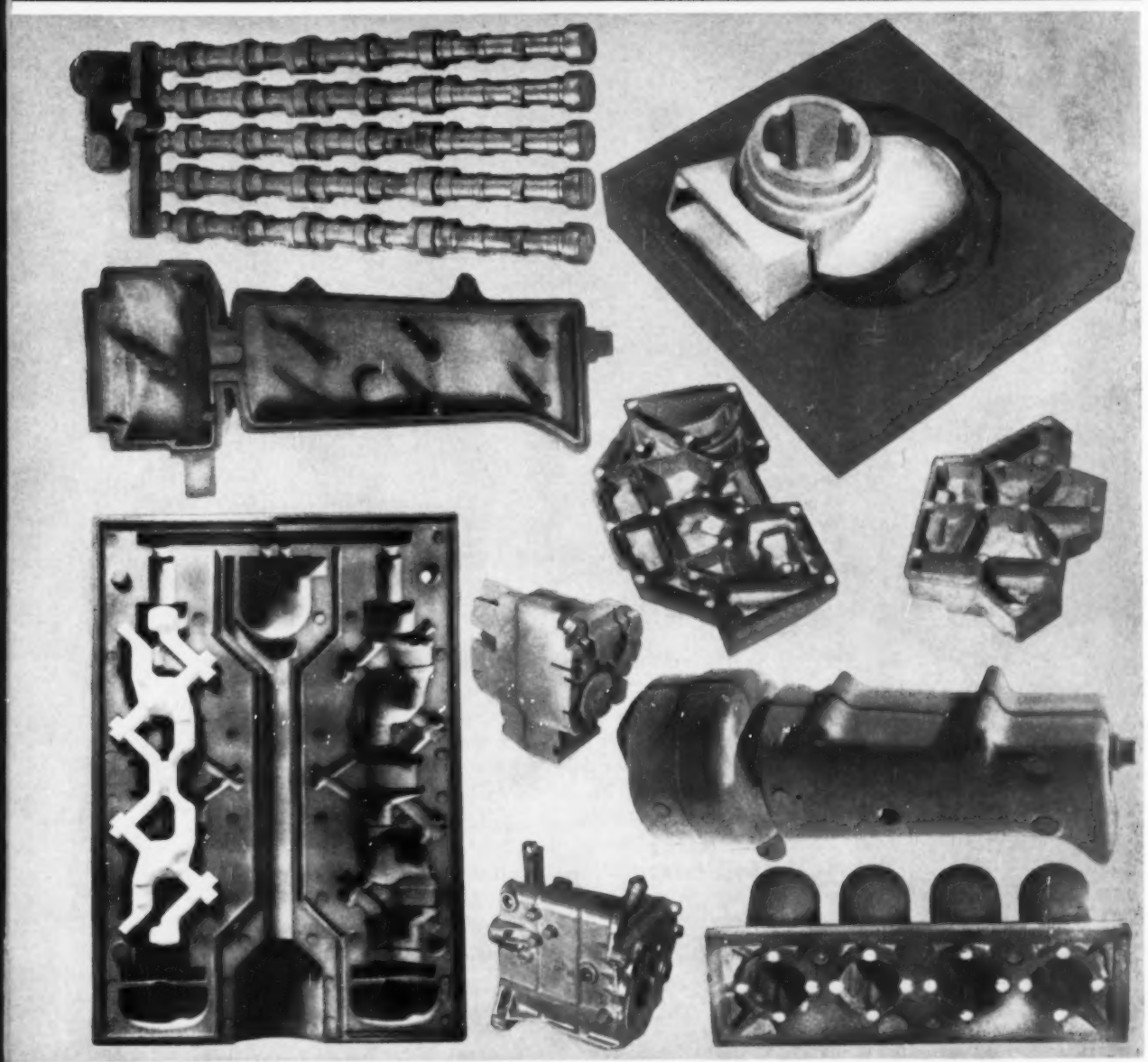
a single station
automatic combination
SHELL CORE
and
SHELL MOLD BLOWING MACHINE
in three sizes
fully automatic



Dedicated to the creative engineering approach in the design

WRITE FOR DETAILS TO: **SUTTER PRODUCTS**

SUTTER



and manufacture of equipment for the metal casting industry

COMPANY

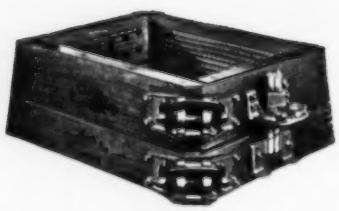
407 HADLEY STREET, HOLLY, MICHIGAN

Circle 557 on Page 53

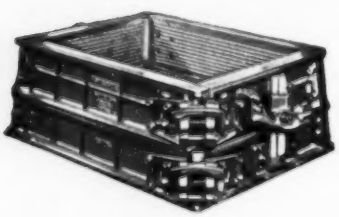
REDUCE YOUR COSTS

ADAMS Cast Iron or Cast Aluminum Jackets

Straight side or any desired Taper



CHERRY EASY-OFF FLASK



ALUMINUM EASY-OFF FLASK

Look at these features and you'll agree that the Adams line can mean economy, efficiency, and better molds for your foundry.

Above is the Adams jacket available in either cast iron or cast aluminum. They are cast from a top grade metal mixture best suited for their purpose. The sturdy construction as a result of the vertical ribs inside and horizontal ribs outside plus the handles at either end assure you of long life for this equipment and ease in handling. These jackets afford you MAXIMUM STRENGTH and MINIMUM WEIGHT.

Here are jackets that assure you perfect mold fit—will give you the greatest strength while under pouring strain—allow for free flow of gases all because of INSIDE CORRUGATIONS. These VENTILATED jackets are first choice in foundries across the nation.

Look into the advantages cast iron or cast aluminum can offer you depending upon your foundry needs. We will be happy to make recommendations to fill your requirements.

For the most complete line of flask equipment available . . . always look to Adams!

The ADAMS Company

ESTABLISHED 1883

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

MOLDING MACHINES and FLASK EQUIPMENT

Circle 558 on Page 53

Making High Quality Steel—At Low Cost

The growing demand for steels of increasingly higher quality has created a new kind of thinking. With conventional methods of obtaining both high quality and quantity being relatively slow, costly and often uncertain, more and more mills are turning to the modern Heroult Electric Furnace as the most reliable and economical means of making high-grade steel in large heats.

To keep abreast of this trend, Sharon Steel Corporation recently built a complete new Melt Shop at its Roemer Works in Farrel, Pennsylvania, and installed the large Heroult Electric Furnace shown above.

This 20′ diameter furnace turns out 90-ton heats of top-quality stainless in less than 8 hours. Space has been provided for a second Heroult when it is needed.

Moreover, electric furnaces are proving to be more efficient and economical in producing most *any* grade of steel in large or small heats. This is because electric furnace operations require a smaller investment, usually reduce both power and charging costs and produce a more uniform product.

American Bridge, exclusive manufacturers of the Heroult Electric Furnace, offers a complete electric furnace service. We have the facilities to handle the complete job—from foundation to furnace, from engineering to erecting. We are also prepared to modernize your old Heroult by installing improved new mechanisms that will increase the efficiency and productivity of your unit. And, if you own a Heroult, we can supply any needed replacement parts.

For more information, get in touch with the office nearest you.

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United States Steel Export Company, New York

Circle 559 on Page 53

OVER
60 YEARS
SERVICE
TO INDUSTRY

GRINDERS

EASIER, FASTER, MORE ECONOMICAL FOR ALL GRINDING OPERATIONS

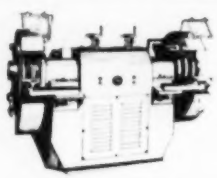
General Purpose Grinder

MODEL 500

General Purpose Floor Grinder, totally enclosed motor, 1 to 5 hp. Push button starter with overload protection. Enclosed ball bearings. Enclosed adjustable wheel guards.

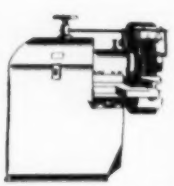
Swing Frame Grinder

Perfect balance, light, flexible, lateral or rotating. Perfect visibility. Single suspension at center. Angular adjustment.



Dual Motor Vari-Speed Grinder

United States Single End and Dual Motor Vari-speed Snagging Grinders provide constant peripheral speed, regardless of wheel diameter resulting in increased production and longer wheel life. Maximum peripheral speed for vitrified or high speed grinding wheels can be maintained for the entire life of the wheel.



Vari-Speed Single End Grinder

WRITE FOR CATALOG
OF THE COMPLETE LINE

The United States Electrical Tool Co.
3640 LLEWELLYN ST.,
CINCINNATI 23, OHIO

Circle 560 on Page 53

With the Editors

BUSINESS PUBLICATIONS: National Business Publications Inc., 1913 Eye Street N.W., Washington 6, is the trade association of the business magazine field. FOUNDRY and its sister publications *Steel, Machine Design, New Equipment Digest,* and *Automation* are members.

Recently NBP raised the question "What is a business publication?" and then proceeded to give an excellent definition, which may be of interest to you. The answer to the question is as follows:

A Business Publication is the medium of specialized know-how designed deliberately for reading by only those specialists who constitute the leadership of the science, profession, industry, or business for which the publication exists.

Through both advertising and editorial content—it seeks to power the progress of the enterprise for which it speaks and to advance the status of the individual practitioner; acts to encourage free and fair competition by and between all elements of the endeavor that it represents; strives to expand the markets and elevate the standards of the field served.

In effect—a Business Publication is a compendium of current self-help ideas and intelligence for both men and women obliged to stay abreast of constant change and the rapid development of new techniques in their respective areas of economic and work interest.

A Business Publication is dedicated to the profitable perpetuation of the organized effort for which it is published; it provides practical promotion for its products or services; preserves its competitive courage; protects its right to prosper.

To keep the promise of its purpose and to prove the reason for its existence, a Business Publication must fulfill two equally basic obligations—one to Advertiser; the other to Reader. As channel of communication for immediate exchange of adult education and business information—reaching always the right person, in the right place, at the right time, in the right frame of mind—it must adhere to a rigid policy of editorial integrity and advertising accuracy.

A Business Publication is a specific-interest periodical issued at fixed intervals and—because of the highly specialized nature of its contents—the advertising pages are read with intent and as avidly as those carrying editorial matter.

A Business Publication is all these and, in concert, the Business Press is the great chorus of special voices speaking up for the forward march of better business through greater knowledge of those investigative, qualitative, promotive, productive, distributive, and administrative processes which build a sound economy.

—o—

AFS Plans Conventions: The following paragraph appeared in Milt Widder's gossip column in the Oct. 26 issue of *The Cleveland Press:* "Our Convention Bureau people closed two tremendous deals for the town—one for '62, the other for '65. The earlier one is with the Instrument Society of America, which will bring 20,000 here in September; the other one with the American Foundrymen's Society, which will bring 15,000 to Cleveland."

Long range planning by AFS provides dates and plans for most of the conventions and exhibitions during the next six years. Reports indicate the following schedule: 1960, convention and major operating exhibit, Philadelphia; 1961, convention and restricted operating exhibit, San Francisco; 1962, International convention and major operating exhibit, Detroit; 1963, technical convention, plans to be decided; 1964, convention and major operating exhibit, Boston; 1965, convention and major operating exhibit, Cleveland.

—o—

Travel: The other day the Business Department wanted to know how many miles the editors traveled during 1959 to attend meetings, visit plants, and interview people for the purpose of keeping our readers informed with developments in the foundry industry. All of us were rather surprised to find that the trips which have been made and those scheduled for the remainder of the year produce a total of slightly over 50,000 miles of editorial travel outside this city.

No wonder you see one or more FOUNDRY editors at so many meetings of foundrymen.

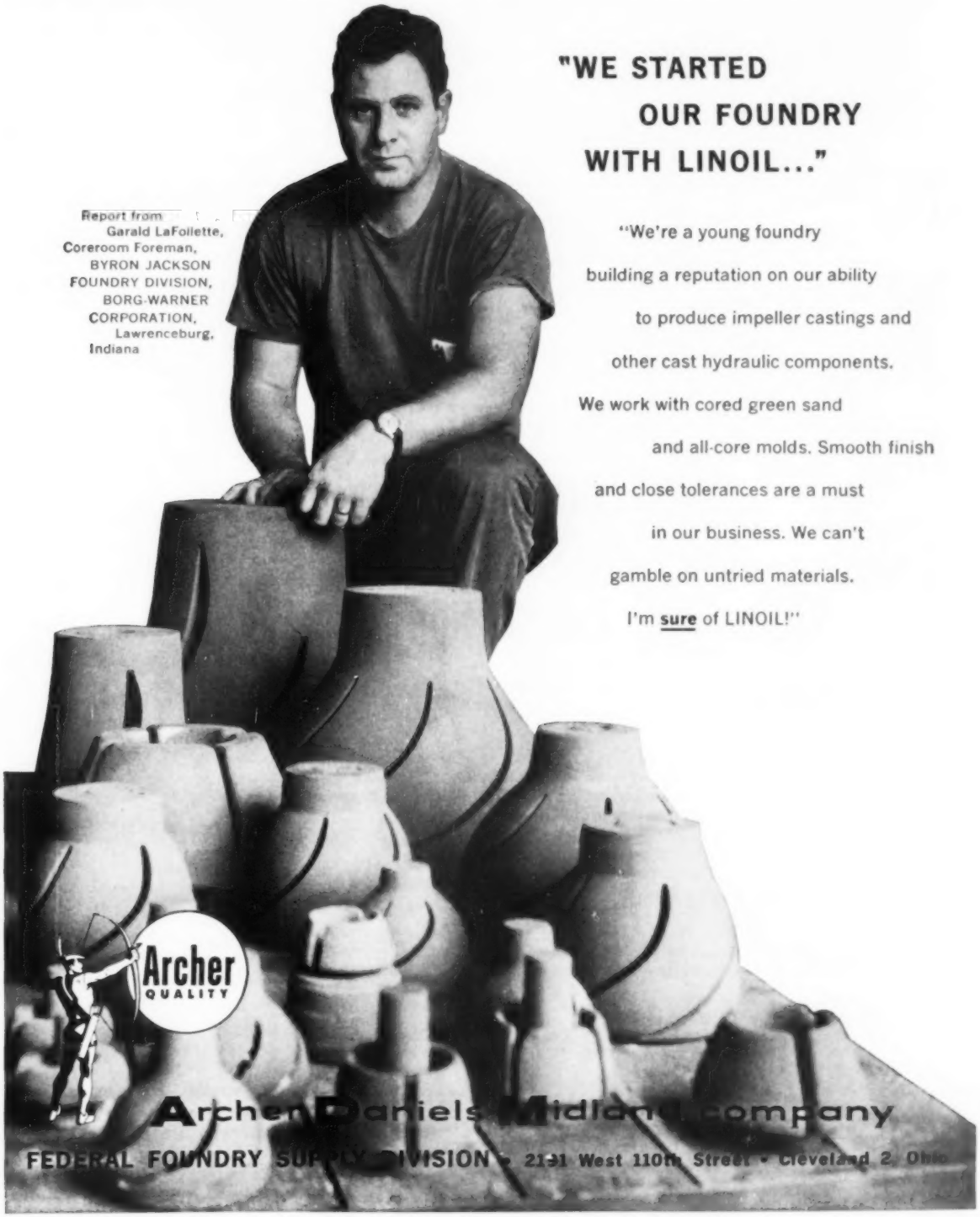
—o—

Want a Copy? Interest continues high in the series of articles on "Solidification and Heat Treatment" which was presented in the September, 1959 issue. So many readers have asked for a copy of this material that a 39-page reprint has been prepared to meet the demand. A single copy may be secured free by sending along your request. Additional copies may be purchased at 50 cents each.

—o—

Smooching: The foundry industry receives publicity—good or bad—for many things. One of the latest to cross our desk was the clipping of a ¾-page article from the Sept. 27 issue of the Chicago Sunday *Tribune* entitled "How To Kiss a Girl, Foundry Worker Style." The presentation, well illustrated with photographs, posed by foundry worker Edward Pszanka Jr. and his

GAMBLERS ?....NO!



Report from
Garald LaFollette,
Coreroom Foreman,
BYRON JACKSON
FOUNDRY DIVISION,
BORG-WARNER
CORPORATION,
Lawrenceburg,
Indiana

"WE STARTED OUR FOUNDRY WITH LINOIL..."

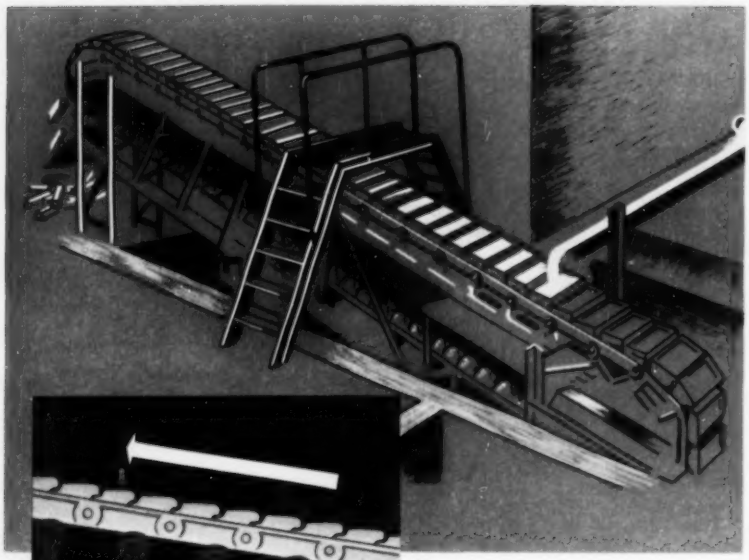
"We're a young foundry building a reputation on our ability to produce impeller castings and other cast hydraulic components. We work with cored green sand and all-core molds. Smooth finish and close tolerances are a must in our business. We can't gamble on untried materials. I'm **sure** of LINOIL!"

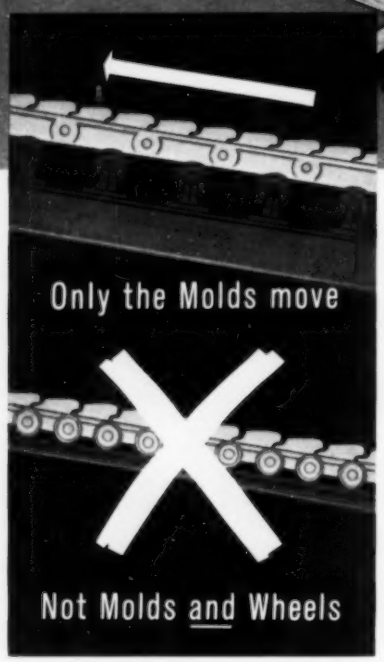
Archer QUALITY

Archer Daniels Midland Company

FEDERAL FOUNDRY SUPPLY DIVISION • 2131 West 110th Street • Cleveland 2, Ohio

Circle 561 on Page 53





Let STATIONARY WHEELS Reduce your Pig Casting Costs

Eliminating 80% of the parts of conventional pig casting machines, this simplified design results in sharp reductions of lost production time and maintenance costs. Since the idler wheels are mounted on anti-friction bearings on the stationary part of the frame, not on the molds, they are positioned as far as possible from hot metal.

Capacities for the machine illustrated: from 3 to 50 tons per hour. Sizes: 15 to 125 feet. Other Bailey Pig Machines are made in single and double strand types and in capacities to 250 tons per hour. Both types feature stationary wheel construction.

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY
1221 BANKSVILLE ROAD PITTSBURGH 16, PA.

fiancee Fran Biener, is based on an article by William Sylvis written in 1866 and republished recently in the *Journal of the Molders and Foundry Workers*.

Here are the suggestions for really satisfying smooching:

1. Know whom you are to kiss. Don't make a mistake, although a mistake may be good.
2. Don't jump up, like a trout for a fly, and smack a woman on the neck, on the ear, or on the corner of her nose.
3. The gentleman should be a little taller.
4. He should have a clean face, a kind eye, and a mouth full of expression.
5. Don't kiss everybody.
6. Don't sit down; stand up.
7. Take the left hand of the lady in your right.
8. Let your hat go—to any place out of the way.
9. Throw your left hand gently over the shoulder of the lady and let it fall down the right side, towards the belt.
10. Gently, yet manfully, press her to your bosom.
11. Be brave, stand firm, but don't be in a hurry.
12. Take good aim, the lips meet, the eyes close, the heart opens, the soul rides the troubles and sorrows of life. Heaven opens before you, the world shoots under your feet, as a meteor flashes across the evening sky.

—o—

Go West: Does the fact that the Gray Iron Founders' Society staged a successful annual convention in San Francisco in 1959, and that the American Foundrymen's Society plans to be there in 1961 suggest that other national organizations in the foundry and allied industries may look to the West Coast for future meetings? Will it be "California—or Seattle or Portland—here we come"?

—o—

Too High: A story in the New York *Times* for Sunday, Aug. 16, includes the following paragraph: A scrap-trade executive noted that it was cheaper to ship scrap by water from the Chicago area to Japan than it was to send it by rail from Chicago to Pittsburgh.

More evidence that we are pricing ourselves out of the markets.

—o—

Season's Greetings: It hardly seems possible that this is the closing paragraph of this department for the final issue of 1959. The year surely moved along at a fast pace. In the next issue we can welcome the new year and do a bit of crystal ball gazing into trends for 1960.

Now all of the folks in the editorial, business, and circulation departments of FOUNDRY, and the printers who turn out such a good job each month, join in wishing you a holiday season filled with much joy and happiness.

F.G.S.

Circle 562 on Page 53

Another new development using

B.F.Goodrich Chemical *raw materials*

NEW LOW-GASSING CORE BINDER FOR LIGHT METAL PRECISION CASTING

NEW GOOD-RITE CB-40 is a unique plastic sand binder especially suited to magnesium and aluminum foundry operations.

Here's how it will cut your costs and improve castings:

Eliminates blow holes . . . provides finer surfaces: Good-rite CB-40 produces exceptionally small amounts of gas, less than 1/10 as much as is obtained from conventional binders. Finer sands can be used for finishes that need no machining.

Provides dimensional stability: The usual expansion and contraction normally caused by baking is eliminated.

Gives excellent collapsibility and shakeout: Rate of collapse is chemically controlled to prevent burn-in. Collapsed sand flows freely from castings.

More efficient baking: No critical oven control needed. Use any present method, or—for fast baking—blow hot air through core box.

Safe to use . . . no odors or fumes: Safe at all stages. Non-toxic, will not burn. Releases no objectionable fumes.

In addition, Good-rite CB-40 requires no special equipment techniques. It minimizes need for inhibitors by providing a reducing atmosphere. This core binder is stable in storage, is unaffected by extremes of time or temperature.

You can get complete information, or samples of Good-rite CB-40, by writing Dept. DD-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Good-rite CHEMICALS

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

Circle 563 on Page 53

"We drive our snagging wheels

"It's one of the toughest test programs in the entire industry. Here at Bay State, every snagging wheel made with a new formula is locked into a steel drum that's built like a gun turret. The wheels are spun at tremendous speeds . . . far beyond anything you can get out of even the newest production grinding equipment. Every wheel under test is accelerated until it actually disintegrates. Then, only the ones that survive the highest speeds before exploding are put into production.

"This is only one of the more spectacular tests we make on all Bay State wheels, of course. There are countless others that probe the ultimate strength factors of every wheel under extremes of heat, vibration, tension, torsion and every other variable. And the *purpose* of these tests goes beyond ordinary standards, too. We are not just trying to produce *acceptable* wheels . . . we're out to make *the best wheels that can be made.*

"*Better grinding at lower cost . . . that is our business.* We think that we can cut *your* grinding costs. Drop us a line or call your Bay State Distributor."

to EXPLOSION SPEED to give you a 4 to 1 safety factor"

Elden L. Auker, Marketing V. P. of Bay State Abrasives, is a man who knows the industry through years of experience both in working in the field with Bay State customers and from close association with the research and development programs at Bay State's manufacturing headquarters in Westboro, Mass.

BAY STATE ABRASIVES

BAY STATE
WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

Circle 564 on Page 53

WHY PAY MORE

when you can buy the best binder at the lowest price!

INSIST ON STEINEX

the original CO_2 Binder available

only **from CarVer**

BEST QUALITY Steinex gives you absolutely the best shakeout — BY FAR!

BEST PRICE Steinex is 30% lower in cost than any other binder on the market!

BEST SERVICE Carver has the in-the-foundry experience and know-how to help you use Steinex in your CO_2 operation — successfully and profitably!

JOIN THE HUNDREDS OF FOUNDRIES THAT INSIST ON THE BEST

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa

RUSH information and prices on Steinex binders.

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

CALENDAR of Meetings

Dec. 2 — Electric Overhead Crane Institute, annual meeting, Carlton House, Pittsburgh.

Dec. 2-4—Metallurgical Society, American Institute of Mining, Metallurgical, and Petroleum Engineers, Electric Furnace Conference, Hotel Sheraton-Cleveland, Cleveland.

Dec. 14-15—Material Handling Institute Inc., annual meeting, Savoy-Hilton Hotel, New York.

Dec. 15—Association of Lift Truck & Portable Elevator Manufacturers, annual meeting, Savoy-Hilton Hotel, New York.

Dec. 16—Industrial Truck Association, annual meeting, Savoy-Hilton Hotel, New York.

1960

Jan. 15—Malleable Founders Society, semi-annual meeting, Hotel Sheraton-Cleveland, Cleveland.

Jan. 25-28—Plant Maintenance & Engineering Show, Convention Hall, Philadelphia.

Jan. 27—Plumbing Brass Institute, Hollywood Beach Hotel, Hollywood, Fla.

Feb. 4-5—Alloy Casting Institute, midwinter meeting, Hotel Key Biscayne, Key Biscayne, Fla.

Feb. 11-12—Wisconsin Regional Foundry Conference, Schroeder Hotel, Milwaukee.

Feb. 18-19—Southeastern Regional Foundry Conference, Thomas Jefferson Hotel, Birmingham.

Feb. 24-25—Malleable Founders' Society, Technical and Operating Conference, Cleveland.

Mar. 7-8—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

Mar. 16-17—Foundry Educational Foundation, annual college-industry conference, Hotel Statler-Hilton, Cleveland.

Apr. 13-14—Malleable Founders' Society, Market Development Conference, Edgewater Beach Hotel, Chicago.

May 9-13—AFS 64th Annual Castings Congress & Foundry Show, Convention Hall, Philadelphia.

May 9-13—American Society for Metals, Southwestern Metal Exposition & Congress, State Fair Park, Automobile Building, Dallas.

May 11-13—Los Angeles Chapter, American Material Handling Society, Western Regional Materials Handling Show and Packaging Cavalcade, Great Western Exhibit Center, Los Angeles.

May 23-26—Design Engineering Show, Coliseum, New York.

June 6-7—Malleable Founders' Society, annual meeting Elbow Beach Surf Club, Hamilton, Bermuda.

June 6-8—Material Handling Institute Inc., New England Show, Commonwealth Armory, Boston.

June 19-21—Alloy Casting Institute, annual meeting, Homestead, Hot Springs, Va.

Sept. 6-16—National Machine Tool Builders Association, Machine Tool Exposition, International Amphitheatre, Chicago.

Sept. 6-16 — Production Engineering Show, Navy Pier, Chicago.

Sept. 19-20—Steel Founders' Society, fall meeting, Homestead, Hot Springs, Va.

Sept. 19-24—International Foundry Congress, Zurich, Switzerland

Oct. 12-14—Gray Iron Founders' Society, annual meeting, Netherland Hilton Hotel, Cincinnati.

Oct. 17-21—American Society for Metals, National Metal Exposition & Congress, Trade and Convention Center, Philadelphia.

Oct. 21-23—Society for Experimental Stress Analysis, annual meeting, Pick Fort Shelby Hotel, Detroit.

Oct. 22-25—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Nov. 8-10—Material Handling Institute Inc., Central States Show, Kentucky Fair and Exposition Center, Louisville.

Nov. 14-16—Steel Founders' Society, Technical and Operating Conference, Carter Hotel, Cleveland.

Why Foundries are Sold on

Carver RAPID MULLER

1 "We are using natural bonded sand in our plant and find the Carver Muller has cut down on bonding material better than 50%. We like the Muller very much."

— G. W. Manfull
West Coast Alloys Co.
Troutdale, Oregon

2 "The Carver does a good job for what it was designed. A low priced mixer. Small floor space and does a good job of mixing with CO_2 Sand."

— Nollan Williams, Vice President
Industrial Castings Division
James H. Mathews Co.
Pittsburgh, Pennsylvania

CHECK . . . COMPARE AND YOU'LL CHOOSE CARVER!

- **The fastest! A batch every 75 seconds!***
- **Only one moving part . . . no maintenance worries!**
- **Absolutely no lumps or wet spots!**
- **Easiest to clean! Just reach inside!**
- **3 times lower initial investment than with most mullers!**
- **Works equally well with any kind of binder!**

*Applies to CO_2 Sand. Oil sand may take up to three minutes.

Only Carver Has Everything For the CO_2 Process!

CARVER V & S Core Shooters

CARVER Automatic Gassing Apparatus

KRAUSS Taper Slot Core Vents

STEINEX available only from CARVER

MAIL COUPON TODAY

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa

I want to compare! Tell me more about Carver Rapid Muller.

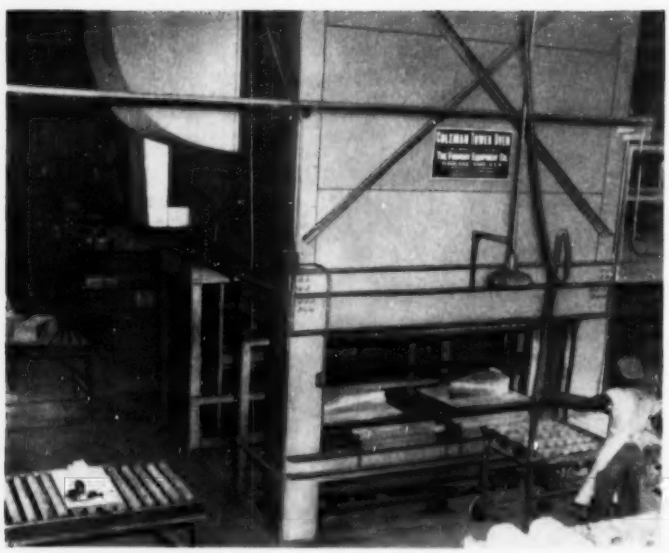
NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

CUT LABOR COSTS with Coleman Conveyor Core Ovens

Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.



One of two large Coleman Tower® Core Ovens in a major steel foundry baking cores up to 150 pounds. Self-amortizing investment . . . ovens paid for themselves out of direct annual savings in less than two years.

● Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%.

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

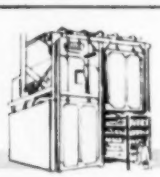
As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

WRITE FOR BULLETIN 54

THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

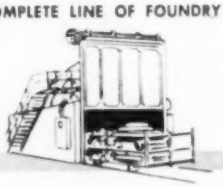
World's Oldest and Largest Foundry Oven Specialists—More than half a century of specialized foundry experience.

PART OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS

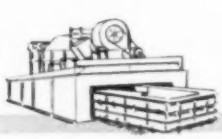


TRANSRACK OVENS

DIELECTRIC CORE OVENS

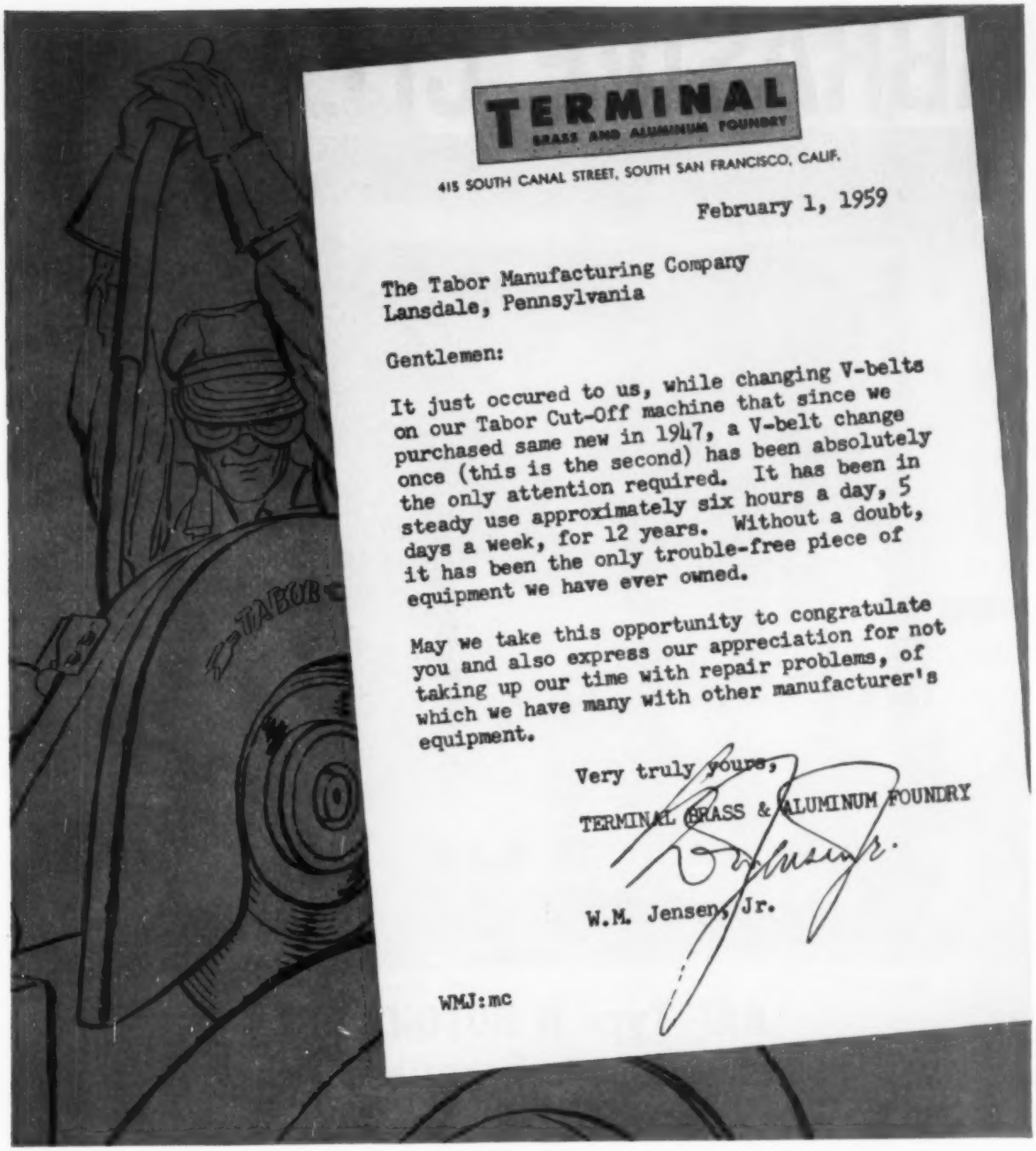


CAR TYPE OVENS



JET ACTION MOLD OVENS

Circle 567 on Page 53


TERMINAL
BRASS AND ALUMINUM FOUNDRY
415 SOUTH CANAL STREET, SOUTH SAN FRANCISCO, CALIF.
February 1, 1959
The Tabor Manufacturing Company
Lansdale, Pennsylvania
Gentlemen:
It just occured to us, while changing V-belts on our Tabor Cut-Off machine that since we purchased same new in 1947, a V-belt change once (this is the second) has been absolutely the only attention required. It has been in steady use approximately six hours a day, 5 days a week, for 12 years. Without a doubt, it has been the only trouble-free piece of equipment we have ever owned.
May we take this opportunity to congratulate you and also express our appreciation for not taking up our time with repair problems, of which we have many with other manufacturer's equipment.
Very truly yours,
TERMINAL BRASS & ALUMINUM FOUNDRY
W.M. Jensen, Jr.
WMJ:mc

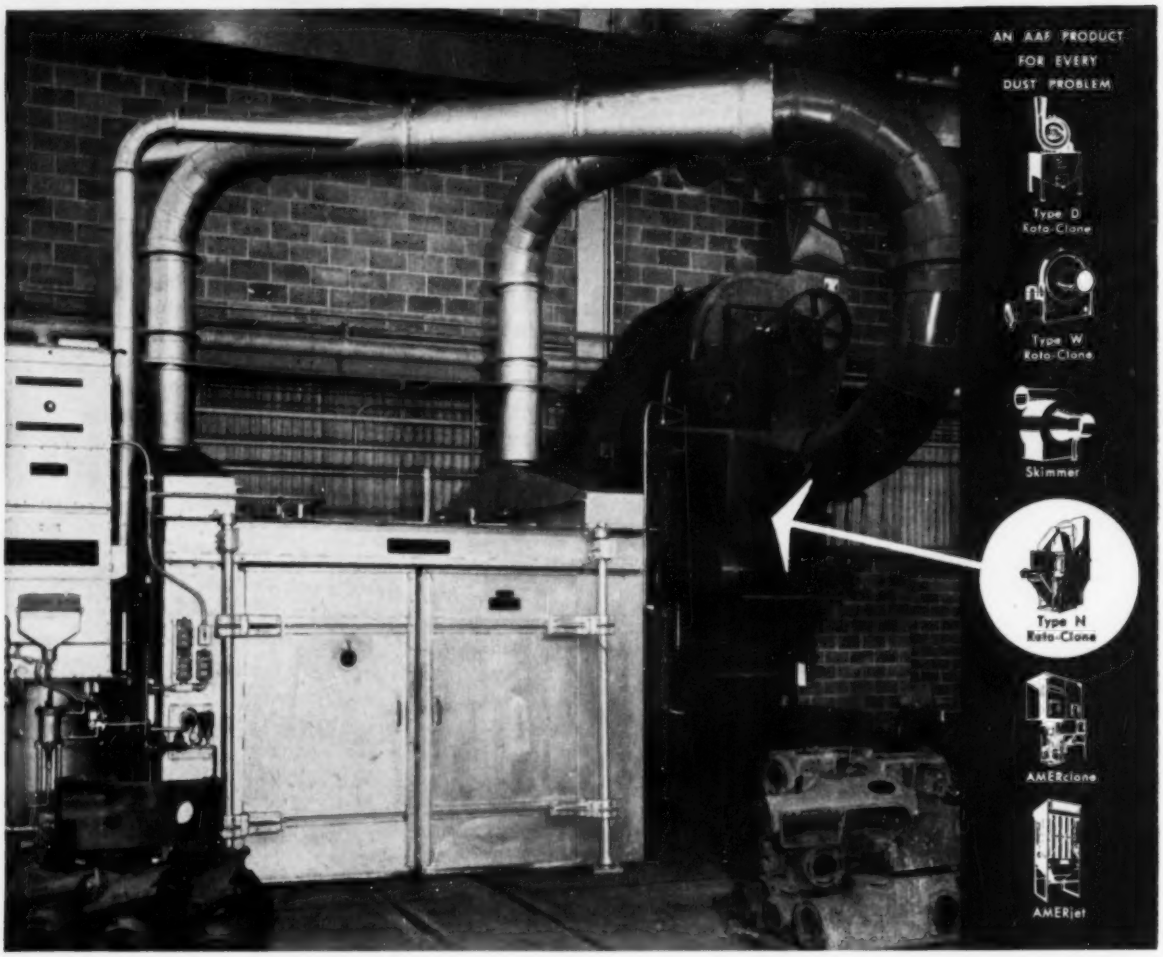
To a busy foundry it is important that all equipment is in operating order at all times. Terminal found that with Tabor equipment there was no time lost repairing machinery or waiting for broken parts. Why not discover what Tabor means by "trouble-free" equipment? Talk to your Tabor Man or write for details to:

TABOR

TABOR MANUFACTURING CO.
Division of Turbo Machine Company
LANSDALE, PENNSYLVANIA

Circle 568 on Page 53

ABRASIVE CLEANING



AAF Type N ROTO-CLONE reduces dust to harmless sludge!

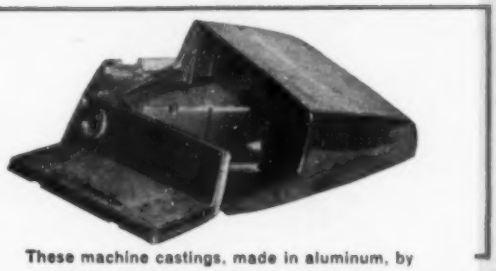
● The dust storms created in this abrasive cleaning operation never "get off the ground," because the AAF Type N ROTO-CLONE collects dust as fast as it is generated. Then, by hydro-static precipitation, the dust is quickly converted into a harmless, easily disposable sludge — preventing secondary dust problems.

This is only one of many applications in which the Type N is keeping dust "under wraps." Its high cleaning efficiency results from the combined action of centrifugal force and thorough intermixing of water and dust-laden air.

AAF's complete line of dust control equipment was application-developed, now challenges *any* foundry dust problem. If *your* problem is abrasive cleaning, contact your local AAF representative or write direct for Dust Control Bulletin 277. Address: Mr. Robert Moore, American Air Filter Co., Inc., 266 Central Avenue, Louisville, Kentucky.

AAF American Air Filter
BETTER AIR IS OUR BUSINESS

Circle 569 on Page 53



These machine castings, made in aluminum, by Elmira Pattern Works, Elmira, New York.

All components of these castings are made of magnesium* by the Curto Ligonier Foundry, Melrose Park, Illinois.

For greater precision . . . in magnesium and aluminum castings . . . use PETRO BOND*

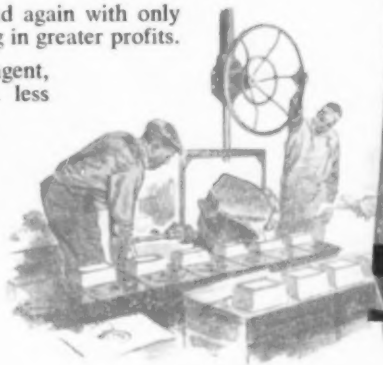
Foundrymen . . . using PETRO BOND as their bonding agent . . . are obtaining greater precision in their castings.

PETRO BOND SANDS are reusable again and again with only infrequent remulling and rebonding . . . resulting in greater profits.

PETRO BOND is a formulated bonding agent, bonding sand with *oil* instead of *water* . . . less gases formed . . . permits use of finer sands with lower permeability . . . gives a finer finish.

You can count on *precision castings* . . . using all ordinary foundry equipment when you use PETRO BOND!

*Registered Trademark of National Lead Co.



BAROID CHEMICALS, INC.

A SUBSIDIARY OF NATIONAL LEAD COMPANY

1809 SOUTH COAST LIFE BLDG. HOUSTON 2, TEXAS

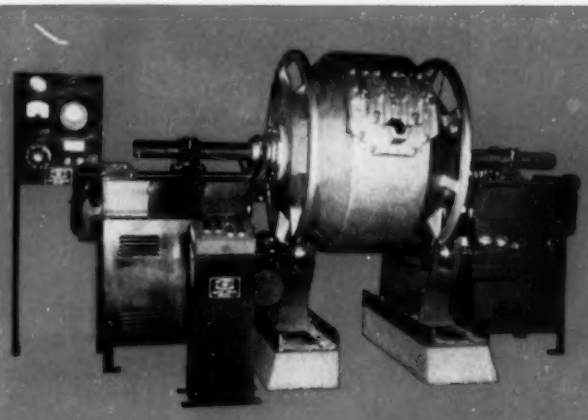
PETRO BOND is available from dealers listed herewith:

Alabama—Foundry Service Co., Birmingham. **California**—Independent Foundry Supply Co., Los Angeles—Industrial & Foundry Supply Co., Oakland 7. **Illinois**—American Steel & Supply Co., Chicago 28—Western Materials Co., Chicago 3—Mathens Company, Moline—John P. Moninger, Elmwood Park. **Indiana**—Steelman Sales Co., Munster. **Massachusetts**—Klien-Farris Co., Inc., Boston 11. **Michigan**—Foundries Materials Co., Coldwater—Foundries Materials Co., Detroit—Warner R. Thompson Co., Detroit. **Minnesota**—Smith-Sharpe Co., Minneapolis. **Missouri**—Walter A. Zeis, Webster Groves. **New Jersey**—Asbury Graphite Mills, Inc., Asbury. **New York**—Combined Supply & Equipment Co., Buffalo—Geo. W. Bryant Core Sands, Inc., McConnellsville. **Ohio**—The Buckeye Products Co., Cincinnati 16—The Hoffman Foundry Supply Co., Cleveland 13. **Oregon**—La Grand Industrial Supply Co., Portland 1. **Pennsylvania**—Pennsylvania Foundry Supply & Sand Co., Philadelphia 24. **Tennessee**—Robbins & Bohr, Chattanooga 2. **Virginia**—Asher-Moore Company, Richmond 25. **Washington**—Carl F. Miller & Co., Seattle 4—Pearson & Smith, Inc., Spokane. **Wisconsin**—Interstate Supply & Equipment Co., Milwaukee 4. **Canada**—Canadian Foundry Supplies & Equipment Ltd., Montreal 30, Quebec (Main Office) and Toronto 14, Ontario. 5951

Circle 570 on Page 53

GET FASTER, CLEANER MELTS

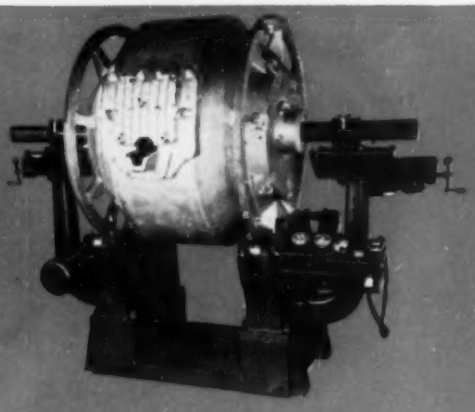
with Detroit indirect arc furnaces 10 through 4000 lbs.



350-4000 LBS. CAPACITY
PEDESTAL-MOUNTED ELECTRODES

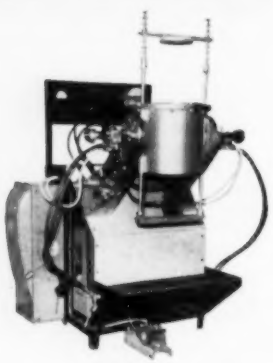
These larger capacity furnaces, with their pedestal-mounted electrodes, are especially suited to rear loading. Electrode carriages are mounted on the pedestals, which also house the automatic electrode control and automatic rocking control. Motor driven electrodes allow automatic control or push button adjustment from any station.

Some of the advantages of Kuhlman indirect arc rocking furnaces are: fast melting, efficient use of power, no contamination of melts, close control of analysis.



60-700 LBS. CAPACITY
BASE MOUNTED ELECTRODES

Base mounting of electrodes, used in Detroit Rocking Furnaces in capacities from 60 to 700 lbs., allows greatest flexibility in the locating of electrical leads. Overhead electrical work can be entirely eliminated. With electrodes rigid and stationary in their mounts, precise alignment is maintained. When electrodes are withdrawn, the shell is free and may be removed for quick replacement.

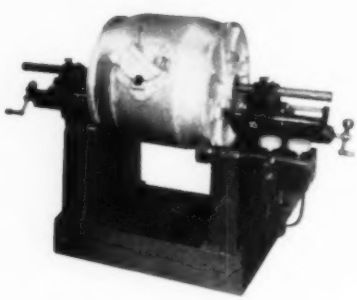


Investment Casting Furnaces

Type IC: 12 Kw., 10 lb. Type ID: 20 Kw., 20 lb. Specially designed for the investment casting of precision parts. Fast, indirect arc melting and direct casting from furnace to clamped-on mold. Both furnaces can be equipped for pressure casting and inert gas melting. Optional equipment also includes adjustable motor driven rocking and roll-over control for uniform melting and casting.

Type PT—Pot Tilting

12 Kw., 15 lbs. capacity. A useful furnace for research and small production jobs. Cover swings aside for loading and pouring. Pot can be carried as crucible or tilted to pour on stand. Requires as little as 25 sq. ft. of floor space.



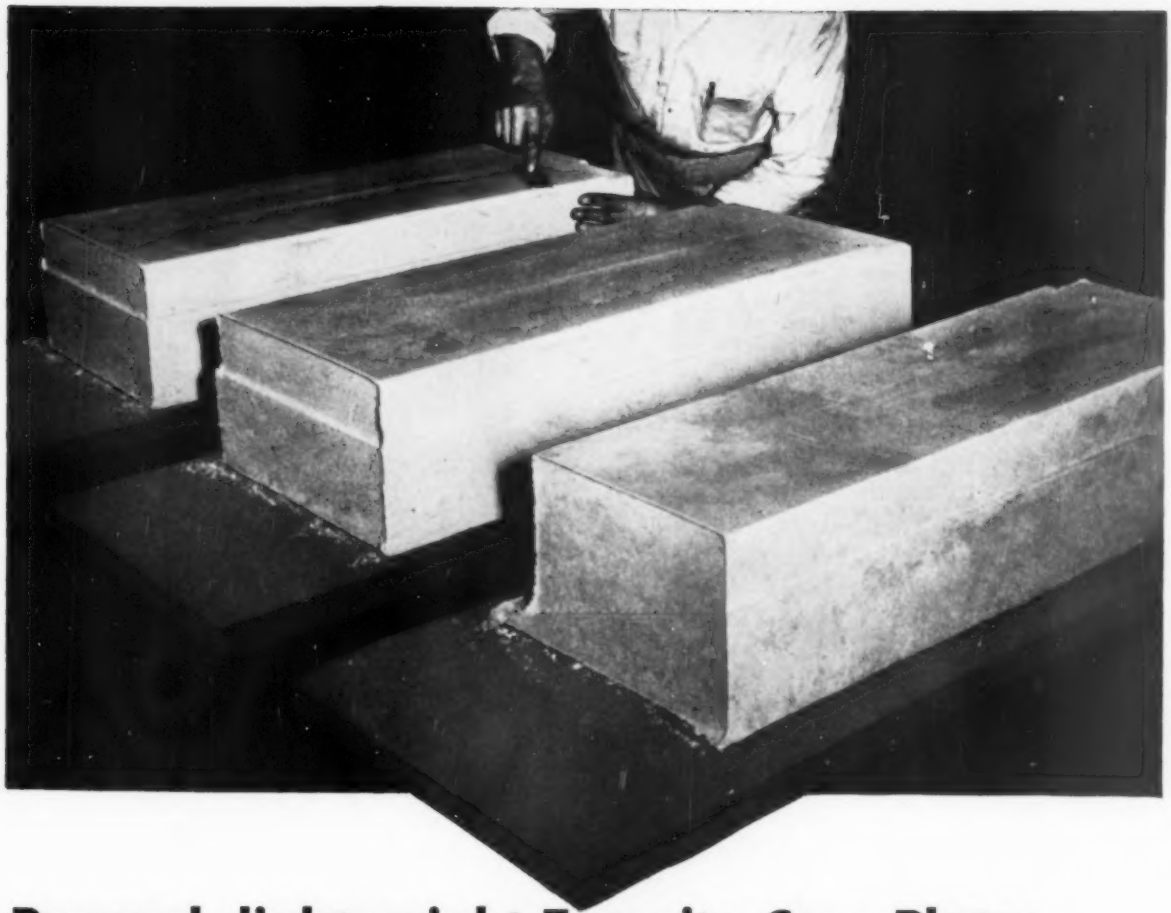
GMS series—for versatility

3 models ranging from 40-100 lbs. capacity. Used for research, quality control and specialty production. Offers automatic control, uniform melts—the same quality features found on our larger furnaces.

For full information, write

DETROIT ROCKING ELECTRIC FURNACE This is our 41st year

Division of Kuhlman Electric Company, Bay City, Michigan



Rugged, lightweight Transite Core Plates add new speed to precision core production

Asbestos-cement composition resists shock, breakage, corrosion . . . is easily cleaned

More and more experienced foundrymen rely on sturdy, finely sanded Transite® Core Plates for the smooth, level surface needed to turn out top-quality cores in minimum production time. The unusually light weight of the boards makes them easy to handle . . . also helps step up production.

How can Transite Core Plates stay smooth and true, even during baking and drying? They're fabricated of fibrous asbestos and cement in a special Johns-Manville process. Year in and year out, the rugged material stands up with a minimum of warpage and wear. Boards resist shock and corrosion, won't crack or break under normal conditions. Surfaces can be easily cleaned, too.

Transite Core Plates have proved themselves in hundreds of ferrous and non-ferrous foundries all over the country. If you haven't already done so, why not give them a chance to go to work, profitably, in your operation?

Get all the facts — send for FREE new Transite Core Plates folder

Whether or not you now use Transite Core Plates, get our FREE new folder IN-219A today! It contains a wealth of helpful information—can make a contribution to *your* profit picture. Send the coupon below.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville, Box 14, New York 16, N.Y.
(In Canada, Port Credit, Ontario)
Please send me booklet IN-219A at no cost or obligation to me.

Name_____ Position_____

Firm_____

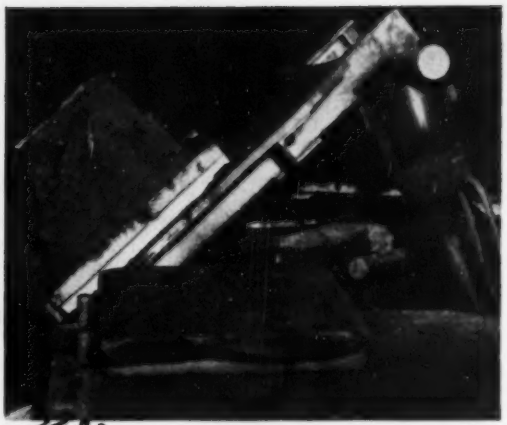
Address_____

City_____ Zone____ State_____

Circle 572 on Page 53

Mechanize with Jeffrey

Jeffrey Universal Mold Conveyor is positively hinged vertically and horizontally, to permit varying elevations to match best work height.



Automatic mold dump eliminates manual effort in normally hazardous area.

WHEN YOUR MOLDS RIDE ...you save time

Jeffrey offers floor type and pendant type (trolley) Mold Conveyors. Both are extremely flexible—can go where you want them to go and at low initial cost. The floor type can be equipped with automatic mold dump, pin-pointing the shakeout operation.

These systems can save you time—and time is money. Write for Catalog No. 911, The Jeffrey Manufacturing Company, 907 North Fourth Street, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

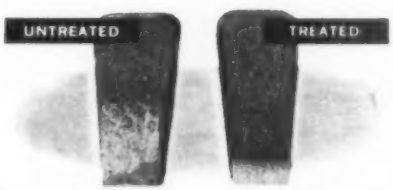
"No machining complaints since I used SMZ alloy"

You can eliminate chilled corners and hard spots in gray iron castings with ladle additions of "SMZ" alloy. Machining rates can thus be improved by as much as 25 per cent, giving you more satisfied customers.

"SMZ" alloy is the most widely used inoculant in the iron foundry industry. As little as 2 to 4 pounds of "SMZ" alloy per ton of iron are sufficient to eliminate chill in light castings. For harder irons of lower carbon and silicon contents, a larger addition of the alloy may be required.

For information on how "SMZ" alloy can improve the machineability of your castings, contact your UNION CARBIDE METALS representative. Ask for the booklet, "SMZ Alloy – An Inoculant for Cast Iron."

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.



These chill blocks show how "SMZ" alloy reduced chill in a 3.15% carbon, 1.80% silicon iron.

UNION CARBIDE METALS

Electromet *Brand Ferroalloys and other Metallurgical Products*

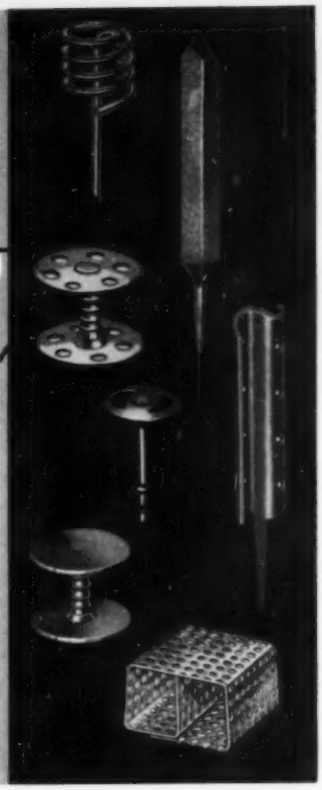
The terms "Electromet," "SMZ," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Circle 574 on Page 53

Whatever you need in Chaplets or Chills . . .

FANNER puts its FACTORY

at your fingertips . . .



THROUGH THIS NETWORK OF EXPERIENCED REPRESENTATIVES AND DISTRIBUTORS

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Protective Life Building
Birmingham 3, Alabama

Hill & Griffith Co.
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Birmingham, Alabama

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Pacific Graphite Co.
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Oakland, Calif.

Pacific Graphite Co.
2522 Malt Ave.
Los Angeles, Calif.

Snow & Galgiani
533 Second St.
San Francisco, Calif.

Barker Foundry Supply Co.
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Atlas Foundry & Supply Co.
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Santa Ana, California

COLORADO

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ILLINOIS

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S. Obermayer Co.
2546 West 18th St.
Chicago 8, Ill.

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Frederic B. Stevens, Inc.
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Indianapolis, Ind.

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Kansas City, Kansas

MASSACHUSETTS

Malcolm Stevens
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Arlington 74, Mass.

Springfield Facing Co.
Willimansett, Mass.

MICHIGAN

A. T. Wagner Co.
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1800 Eighteenth
Detroit 16, Mich.

Wolverine Foundry Supply Co.
3211 Belleview Ave.
Detroit, Mich.

E. J. Woodison Co.
7415 S. Aubin
Detroit, Michigan

MINNESOTA

C. D. Gallaher Co.
428 Stinson Blvd.
Minneapolis 13, Minn.

MISSOURI

M. A. Bell Co.
217 Lombard St.
St. Louis 2, Mo.

St. Louis Coke & Fdry. Sup. Co.
1525 Sublette Ave.
St. Louis 10, Mo.

NEW JERSEY

Springfield Facing Co.
S. 2nd & Bergen Sts.
Harrison, N. J.

NEW YORK

E. J. Woodison Co.
146 Chandler
Buffalo, N. Y.

Frederic B. Stevens, Inc.
93 Stone St.
Buffalo 10, N. Y.

Lovejoy Patent Spec. Co.
Hoosick Falls, N. Y.

George Koehn
#3 Gayle Rd.
Skaneateles, N. Y.

OHIO

Buckeye Products Co.
7020 Vine St.
Cincinnati, Ohio

Goehringer Foundry Sup. Co.
919 West Fifth
Cincinnati 3, Ohio

Hill & Griffith Co.
1262 State Avenue
Cincinnati, Ohio

Federal Foundry Supply Co.
4600 East 71 St.
Cleveland 5, Ohio

Galion Foundry Spec. Co.
131 W. Walnut St.
Galion, Ohio

Fenton Foundry Supply Co.
134 Gilbert Ave.
Dayton, Ohio

The S. Obermayer Co.
647 Evans St.
Cincinnati 4, Ohio

Hoffman Foundry Supply Co.
1193 Main Ave.
Cleveland, Ohio

OREGON

LaGrand Industrial Sup. Co.
155 W. Arthur
Portland, Oregon

PENNSYLVANIA

J. S. McCormick Co.
25th St. & A. V. R. R.
Pittsburgh 22, Pa.

S. Obermayer Co.
33rd & A. V. R. R.
Pittsburgh 1, Pa.

William E. Hoffman & Co.
3404 Circle Ave.
Reading, Penna.

J. J. McCoy
5232 Hutchison
Philadelphia, Pa.

TEXAS

M. A. Bell Co.
5802 Colfax Ave.
Houston, Texas

WASHINGTON

Pearson & Smith
W. 1133 College Ave
Spokane, Washington

Carl F. Miller & Co.
1217—6th Ave., S
Seattle, Washington

WISCONSIN

Fire Brick Engineers Co.
2400 S. 43rd St.
Milwaukee 46, Wisc.

Foremost Foundry Supply Co
2400 S. 43rd St.
Milwaukee 46, Wisc.

In the Fine FANNER Line there are thousands of different types and sizes of chaplets and chills, each designed to be best for its particular application. Yet you can have the chaplets or chills for your needs at your fingertips almost at a moment's notice through FANNER's nationwide network of distributors—or from FANNER direct. Both are equipped to assist you in the selection of the right chaplet or chill for your requirement . . . both are at your service. Write for Chaplet and Chill catalogs.

THE FANNER MANUFACTURING COMPANY

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

model HAH PAYLOADER® "the most economical loader ever used in this work"*

*Says J. A. Merritt, Night Foreman of Dewey Bros., Inc. foundry at Goldsboro, N. C., "it has given over 3 years of continuous service with only 3 nights lost time. It has proven to be the most economical loader ever used in this work. 'PAYLOADER' tractor-shovels are designed and built for maximum production output under adverse work conditions."

This 74-year old foundry has three "PAYLOADER" models, the first purchased six years ago. They are used to carry new castings from the pouring floor to the cleaning room, to scoop sand from the floor and deliver it to the shaker, to deliver sand from the mullers to the sand cutter, and to do miscellaneous handling work.

Whether your needs are for outdoor or for indoor work, for unloading box cars of bulk materials or large-tonnage stockpile operations, there's a dependable "PAYLOADER" tractor-shovel available including 4-wheel-drive models up to 12,000 lb. carry capacity, plus many useful attachments. Your Hough Distributor is ready to serve you with complete sales, service and parts stocks.

HOUGH®

THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO.
703 Sunnyside Ave., Libertyville, Ill.

Send data on all "PAYLOADER" models and attachments

Name _____
Title _____
Company _____
Street _____
City _____ State _____

12-A-3

Circle 576 on Page 53

OUR VERY POPULAR SC5X166 HEAT GLOVE

As against a leather faced asbestos glove, the SC5X166 will save you close to 45% in cost. The split cowhide is specially chrome tanned for heat resistance. Clute cut. Extra heat insulation due to heavy lining. Leather strap around thumb crotch reinforced. Lined 4" leather cuff. (Duck cuff will save an additional 8%)

SC6X151 ONE-FINGER MITTEN

Offers even further economy because it has fewer seams than a glove, and seams are the most vulnerable area in hand protection. Chrome tanned split cowhide . . . heavy lining 4" leather cuff. Also available in full mitten as SC6X180.

Workers Handle Things Coolly...Longer in AO Heat Gloves Like These...

(SPECIALLY TANNED COWHIDE IS THE PAYOFF)

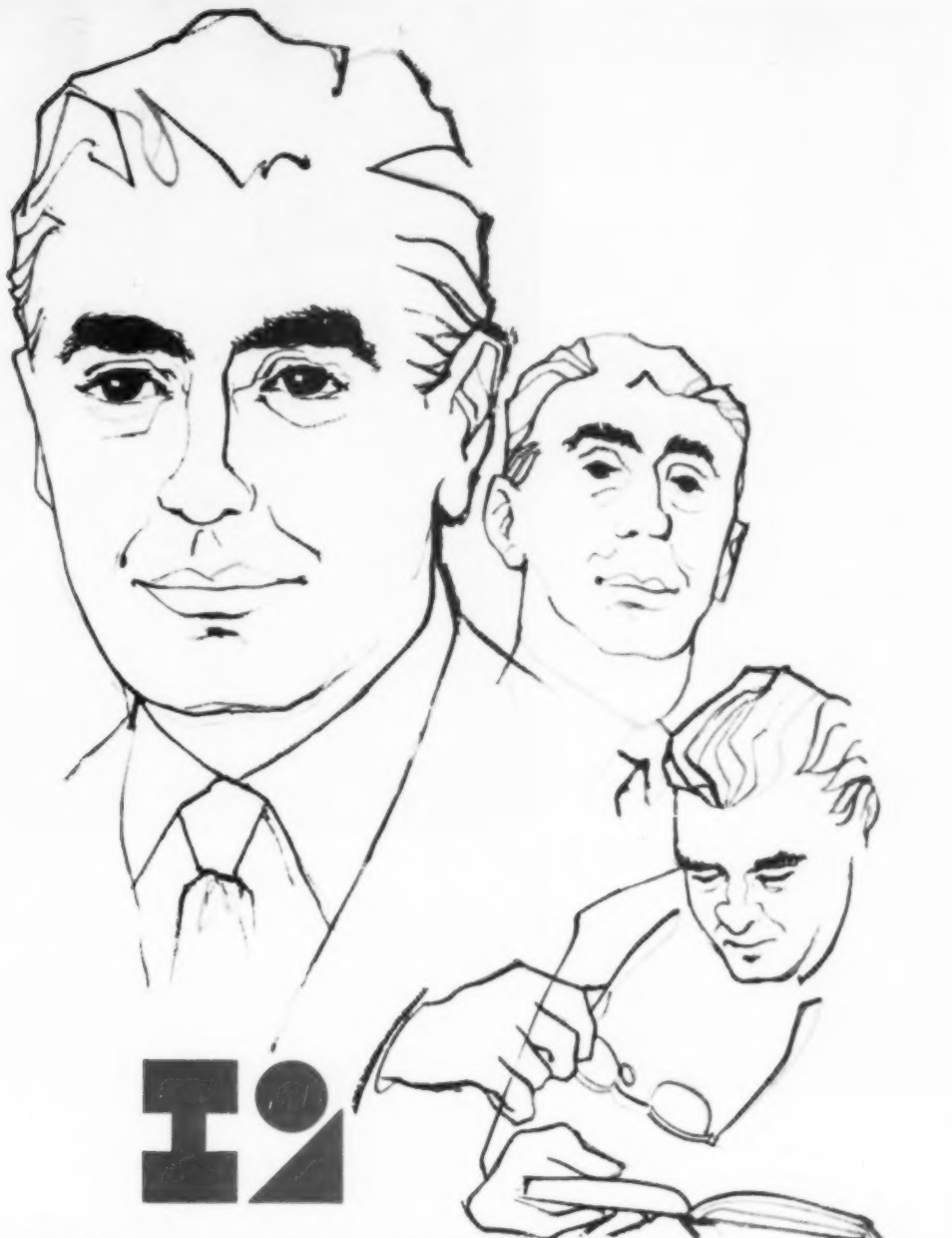
Asbestos is an excellent protective material for hand exposure to hot materials — but you may find that on many operations our specially tanned cowhide is better — *and will cost you less!* (AO can supply you with either.)

One large foundry switched from asbestos to AO specially tanned cowhide and obtained five times the service life — in addition to lower initial cost! AO heat gloves and mittens have full heavy linings and are also available with ***heavy lined duck cuffs*** — offering additional savings as against leather cuffs. For long wear on annealing operations, die casting, drop forging, steel mill coil tying, block bending in shipyards and other work, consider the durability and economy of AO Heat Gloves — and put them on your men.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION
ALWAYS INSIST ON TRADEMARKED SAFETY PRODUCTS

SOUTHBRIDGE, MASSACHUSETTS

Safety Service Centers in Principal Cities



YOUR THIEM REPRESENTATIVE

Your most direct line to better casting surfaces is your Thiem representative. He's trained in foundry fundamentals and better foundry methods. Knowing how to improve casting production and produce smoother finish castings is his job. Supporting his services is a modern laboratory exclusively devoted to foundry research.

THIEM DISTRIBUTORS

Brumley-Donaldson Company
Los Angles & Oakland, Calif.

Combined Supply & Equip. Co., Inc.
Buffalo, New York

Lancaster Frdy. Supply Co.
Lancaster, Penna.

LaGrand Industrial Supply Co.
Portland, Oregon

Manufacturers Equip. & Supply Co.
Chattanooga, Tenn.
& Birmingham, Ala.

Fire Brick Supply Co.
St. Paul, Minnesota

Western Foundry Sand Co.
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Kramer Industrial Supply, Inc.
Denver, Colorado

Everitt H. Lueders
Bala Cynwyd, Penna.

Pearson & Smith
Spokane, Washington

Sinclair-Brandt Equip. & Supply Co., Houston, Texas

Don Barnes Limited
Hamilton, Ontario, Canada

James Crain, Caseyville, Illinois

THIEM PRODUCTS INC.
MILWAUKEE 19, WISCONSIN
Manufacturers of foundry products exclusively

Circle 578 on Page 53

From a pile of sand to a rigid mold in 4 minutes

Core for automotive spring hanger

Sodium Silicate-CO_2 Process

You can produce cores in a matter of seconds with the sodium silicate-CO_2 process. With this quicker core-making technique, a binder based on Du Pont Sodium Silicate is mixed with fine core sand . . . CO_2 is the curing agent.

During gassing, CO_2 reacts with the sodium silicate to form a tough gel that hardens while sand is in *direct contact* with patterns. Strong, high-tolerance cores are produced . . . yet collapse easily during shake-out.

The sodium silicate-CO_2 process offers production-line speed . . . eliminates the need for drying and baking equipment. Cores are ready for metal pouring *immediately* after curing. The over-all production cycle is faster. And foundry workers prefer CO_2 molding because there are no objectionable fumes.

Ask your foundry supplier for full details about this time- and money-saving process, or write us for names of suppliers of binders based on Du Pont Sodium Silicate. *E. I. du Pont de Nemours & Co. (Inc.), Industrial and Biochemicals Dept., Room N-2533, Wilmington 98, Delaware.*

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Steps in CO_2 core-making process . . .

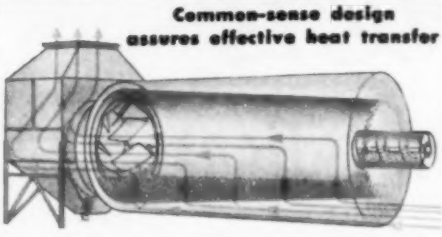
1. Standard muller is used to mix sodium silicate-based binder and core sand.

2. Mixed core sand is tamped into form, then packed with pneumatic rammer.

3. Packed core mold is placed over CO_2 jet and quickly cured by gassing.

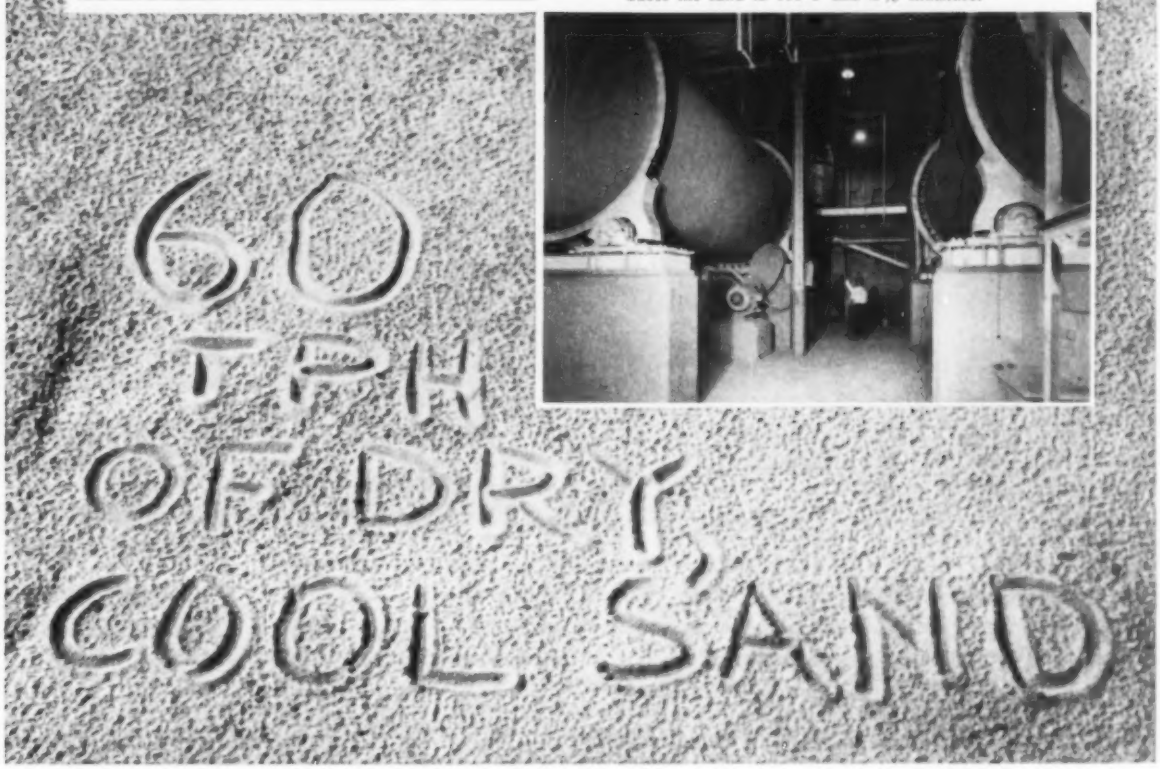
4. Cured cores are **immediately** ready for metal pouring.

Common-sense design assures effective heat transfer



Link-Belt Roto-Louvre has largest volume of air penetrating thin bed of sand near feed end, where greatest evaporation takes place. Gradual heat transfer from gentle rolling action of sand over slowly revolving louvres eliminates spotty over- and under-drying.

The Roto-Louvres below, installed at a large midwest automotive foundry, receive sand having moisture of 8%. They dry the sand to a moisture content of .75% and discharge it at 135°F. Using 80°F air, a Roto-Louvre cooler then reduces the sand to 100°F and .5% moisture.



. . . with LINK-BELT Roto-Louvre dryers and cooler

Two Link-Belt Roto-Louvre dryers and one cooler have eliminated a costly sand shortage problem for a large midwest automotive foundry.

Because their old system was inadequate and antiquated, additional dried sand had to be purchased at premium costs. Now, with the high-capacity Link-Belt dryers and cooler, production needs are easily met. What's more, the new system is designed to handle anticipated future needs.

This is just one of many foundries that have found Link-Belt Roto-Louvre to be the low-cost answer to needed capacity. Roto-Louvre efficiency results from an exclusive design that assures positive temperature control . . . and uniform air contact with *every* grain of sand.

Roto-Louvres can be used as dryers, dryers-coolers or coolers. For details, contact your nearest Link-Belt office. Or write for Foundry Equipment Book 2423 and Roto-Louvre Book 2511.

LINK-BELT

HANDLING AND SAND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15.2200

Circle 580 on Page 53

Let's CUT COSTS

on these Secondary Operations

- DRILLING
- REAMING
- TAPPING
- TURNING
- MARKING
- PUNCHING
- GRINDING
- ROUTING
- SAWING
- THREADING

High cost second operations can kill first operation profits. If you perform any of the above secondary operations, better take a critical look at how you do it. There may be cost saving opportunities you've overlooked.

If any one of them involves hand feeding of parts or tools—hand clamping—or mechanical means of performing push, pull or lift motions—The Bellows Co. can save you money.

The Bellows Air Motor and the numerous Bellows packaged pneumatic work units can, in a few minutes, transform hand operated machines and machine tools into fast automatic or semi-automatic production units. They are inexpensive to buy—your own tool room can install them quickly.

Here's how to start —

Write for these two booklets. Bulletin ML-5 and BM-25 will give you a quick picture of what others are doing—of what you can do — in cutting second operation costs. Write Dept. FO-1259, The Bellows Co., Akron 9, Ohio. In Canada: Bellows-Valvair, Toronto 18, Ontario.

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION

AKRON 9, OHIO

894-B-2

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

Late News

STRIKE IMPACT: Effects of the steel strike on shipments of castings became increasingly apparent in recent weeks. And some time will be required before its influence is dissipated completely even though a permanent settlement is reached in the labor dispute. In the first half of this year casting shipments were 40 per cent ahead of the 1958 period. From present indications 1959 as a whole will show a gain of little more than 25 per cent over last year. A big item is the million-ton loss in production of ingot molds during the steel shutdown.

FOUNDRY EXPANSION: Mackintosh-Hemphill Div. of E. W. Bliss Co. is spending more than $1 million on improvements at its Midland, Pa., plant. New equipment will include two annealing furnaces, mold drying oven, enlarged roll casting pits, and new material handling facilities.

Lynchburg Foundry Co. will provide additional molding and mold handling equipment, plus a new employees' washroom building, at Lynchburg, Va., at a total cost of about $250,000.

Precision Castparts Corp., Portland, Oreg., plans a 15,000-sq-ft expansion to its plant to provide additional space for research, development, and production facilities. It will bring total floor space to 50,000 sq ft.

MERGERS: Dow Chemical Co. has purchased the capital stock of Sequoia Metalcraft Co. Inc., a magnesium foundry in San Carlos, Calif., and will operate it as a wholly-owned subsidiary . . . Midland-Ross Corp., Cleveland,

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1957	55,688,592	9,220,405	1,026,951	8,876,400
1958				
June	4,409,906	615,271	62,703	605,733
6 mo. ..	22,982,262	3,751,164	390,428	3,347,626
July	3,716,739	543,726	47,203	513,894
Aug.	4,203,034	580,844	66,877	592,727
Sept.	4,472,219	689,660	71,198	637,400
Oct.	5,091,207	707,378	90,707	757,722
Nov.	4,803,615	700,704	74,382	691,078
Dec.	4,973,670	761,494	80,593	712,779
Total ...	50,242,746	7,725,970	821,388	7,152,726
1959				
Jan.	5,375,042	783,045	86,519	767,289
Feb.	5,657,873	791,137	88,326	801,692
Mar.	6,677,499	873,982	101,986	965,048
Apr.	6,644,905	911,313	106,972	996,126
May	6,642,572	868,661	99,256	1,029,573
June	6,322,404	885,497	104,683	997,921
6 mo. ..	37,338,295	5,113,635	607,742	5,557,649

Index of Foundry Equipment Orders

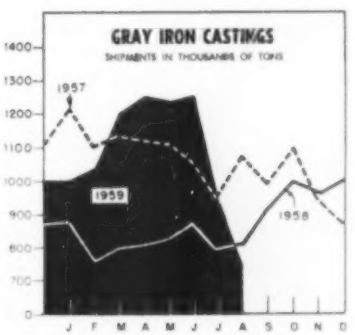
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1958	1959
Jan.	57.9	127.4
Feb.	57.6	237.1
Mar.	85.9	166.6
Apr.	88.7	154.2
May	136.1	157.0
June	87.7	125.1
July	77.9	110.7
Aug.	74.1	134.1
Sept.	64.5	131.3
Oct.	118.9	....
Nov.	83.3	....
Dec.	137.0	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons*)

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[3]	Soil Pipe & Fittings Total[3]	Unfilled Orders[4]
1957	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	359,332	1,351,345	788,308	.....
1958										
Aug.	892,475	513,862	410,876	205,821	8,323	165,906	18,537	129,157	78,597	614,199
8 mo. ..	6,505,584	3,715,034	3,881,507	1,698,763	74,026	1,090,927	184,539	839,112	509,799	.....
Sept.	916,704	537,717	518,185	227,414	7,902	175,323	20,783	125,693	76,720	644,534
Oct.	992,730	586,614	551,380	253,062	10,857	207,500	22,976	129,375	81,505	619,667
Nov.	958,306	505,290	575,586	231,669	11,731	201,704	18,801	98,326	63,889	602,375
Dec.	997,608	509,499	628,720	246,289	13,072	208,942	18,02.	85,179	56,746	608,096
Total ...	10,371,232	5,863,154	6,155,378	2,657,197	117,588	1,884,396	265,114	1,277,655	788,659	.....
1959										
Jan.	1,001,771	517,390	625,604	250,161	12,581	214,985	27,650	75,571	58,056	687,245
Feb.	1,036,655	538,514	642,882	252,115	12,619	230,706	31,035	76,147	55,885	767,360
Mar.	1,205,572	666,034	701,527	286,692	13,881	270,293	35,820	108,131	89,801	846,937
Apr.	1,245,702	685,755	726,105	296,982	14,663	270,476	35,655	129,861	83,605	892,214
May	1,236,280	665,285	706,073	285,507	16,003	275,563	36,960	141,675	75,979	884,779
June	1,252,016	717,067	707,291	295,064	15,510	268,479	30,723	160,540	84,983	836,707
July	943,486	532,976	602,261	252,907	14,508	107,804	20,486	133,175	79,960	897,536
Aug.	742,564	506,756	455,444	254,232	11,046	13,482	18,479	145,853	80,306	872,993
8 mo. ..	8,665,026	4,852,777	5,197,187	2,172,660	110,291	1,651,558	236,808	970,952	608,575	.....

*Source: U. S. Dept. of Interior Bureau of Mines. [2]Source: Bureau of Census. [3]For sale only. [4]All cast iron pipe is shipped for sale.

Late News

has acquired Surface Combustion Corp., Toledo, Ohio . . . Chain Belt Co., Milwaukee, has acquired the Carrier Conveyor Corp. and its wholly-owned subsidiary, General Industries, both of Louisville, Ky.

ARKANSAS FOUNDRY: A $1½ million gray iron foundry will be built on a 30-acre site on the New Benton Highway south of Little Rock, Ark., by Midwest Casting Corp. Midwest is headed by Jackson T. Stephens, president of Stephens Inc., a Little Rock investment firm, and associates. The latter include Vernon J. Giss and G. W. Dickey, officers of Stephens Inc.

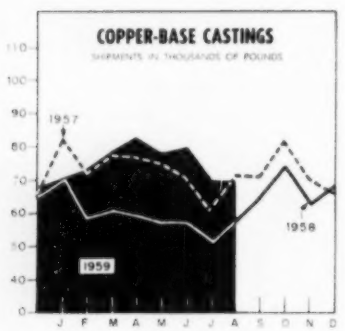
SELLS FOUNDRY: Badger Meter Mfg. Co., Milwaukee, has sold its wholly-owned subsidiary, Fall River Foundry Co. Inc., Fall River, Wis., to a group headed by William C. Wright, formerly Badger vice president and president of Fall River Foundry since 1954. The modern 43,000-sq-ft nonferrous foundry was built in 1954 and enlarged in 1958. Officers in addition to Mr. Wright are Harold E. Younger, vice president and general manager; S. C. Lawson, sales vice president; Harold Houy, foundry superintendent; and Joseph Farrell, production manager.

CHANGES HANDS: Hartford Electric Steel Corp., Hartford, Conn., is being acquired on Dec. 1 by New England Alloy Casting Corp. The latter, a newly formed company, is a subsidiary of Quaker Alloy Casting Co., Myerstown, Pa. No changes in operating personnel at Hartford are contemplated.

DIECASTING CONFERENCE: The Society of Die Casting Engineers is sponsoring a chartered flight for its members to the Third International Pressure Die Casting Conference at Stresa, Italy, May 16-20. The trip will cover from April 30 through May 29 at a cost of $1000 including conference fees. An alternative plan which costs $840 permits visitors to travel on their own May 21 through May 27.

ICI OFFICERS: J. H. Morison, president, Hitchiner Mfg. Co., Milford, N. H., was elected president of the Investment Casting Institute

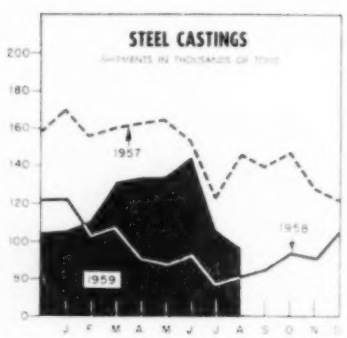
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1957	874,627	789,014	44,789	.....
1958				
Aug.	57,790	52,981	2,425	24,851
8 mo.	471,075	426,369	21,163	.....
Sept.	64,447	58,435	2,888	25,655
Oct.	74,012	67,564	3,239	26,726
Nov.	62,746	57,386	2,604	24,928
Dec.	67,905	61,119	3,535	25,078
Total	740,155	670,873	36,429	.....
1959				
Jan.	70,123	62,266	3,753	25,344
Feb.	72,754	64,538	4,007	26,468
Mar.	78,641	69,472	4,333	29,373
Apr.	82,799	73,567	4,640	29,941
May	78,413	69,351	4,363	27,074
June	79,366	70,512	4,421	30,389
July	69,073	61,650	3,869	31,820
Aug.	69,304	60,671	4,410	32,167
8 mo.	600,473	532,047	33,796	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

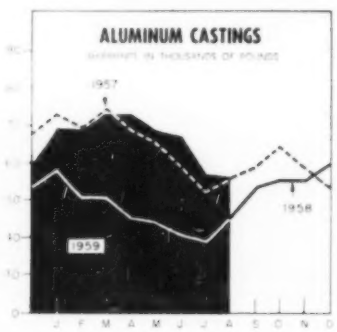
	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1957	1,766,191	1,359,747	349,059	1,328,478	1,019,090	324,951	437,713	340,657	24,108	.....
1958										
Aug.	80,856	59,816	8,021	57,539	42,069	7,090	23,347	17,447	931	196,300
8 mo.	751,267	571,885	105,350	537,740	405,306	96,931	213,527	166,279	8,419	.....
Sept.	85,277	64,586	9,205	60,392	44,890	7,905	24,885	19,696	1,300	196,482
Oct.	95,389	73,367	12,254	67,906	51,065	10,980	27,483	22,302	1,274	184,925
Nov.	85,267	65,788	9,648	59,793	45,808	8,501	25,474	19,980	1,147	193,960
Dec.	103,800	81,360	13,187	76,015	59,171	11,934	27,785	22,189	1,253	214,352
Total	1,121,000	856,986	149,644	801,846	606,240	136,251	319,154	250,746	13,393	.....
1959										
Jan.	105,392	82,683	14,408	76,242	59,027	12,948	29,150	23,656	1,460	232,646
Feb.	110,280	86,013	14,686	79,365	61,261	13,316	30,645	24,752	1,370	245,096
Mar.	131,317	103,848	20,086	93,309	75,968	18,410	35,008	27,880	1,676	270,682
Apr.	134,344	104,890	21,372	99,295	76,802	19,761	35,049	28,088	1,611	271,613
May	135,359	105,804	23,825	101,504	78,767	22,498	33,855	27,037	1,327	263,969
June	143,624	111,725	26,567	107,000	82,485	24,568	36,624	29,240	1,999	248,782
July	106,790	83,541	16,007	78,316	60,502	14,520	28,474	23,039	1,487	274,065
Aug.	98,014	79,188	17,607	74,825	60,243	16,373	23,189	18,945	1,234	279,261
8 mo.	965,120	757,892	154,558	709,856	555,055	142,394	251,994	202,637	12,164	.....

[1]Source: Bureau of the Census. [2]For sale only.

at its annual meeting Nov. 3-4. Other officers are R. E. Gray, vice president, Gray-Syracuse Inc., Manlius, N. Y., vice president-management division; R. F. Waindle, president, Wai-Met Alloys Co., Detroit, vice president-technical division, and L. R. Schwedes, partner, Lawrence Laboratory, Santa Monica, Calif., treasurer.

PERSONALS: Albert L. Hunt has been appointed executive vice president, Superior Foundry Inc. and its Allyne-Ryan Div., both of Cleveland. Mr. Hunt formerly was vice president in charge of operations, National Bearing Div., American Brake Shoe Co., St. Louis . . . E. Roy Russell has retired as president, Florence Pipe Foundry & Machine Co., Florence, N. J., and its subsidiary, R. D. Wood Co. . . . William Butler III has been appointed administrative assistant to the president, Wheelabrator Corp., Mishawaka, Ind. . . . Robert A. Barr has been elected a vice president of Babcock & Wilcox Co., New York, in charge of the Refractories Div. He replaces James E. Brinckerhoff, who will retire Dec. 31 after 40 years of service . . . John K. Hodgson, secretary, Hodgson Foundry Co., Chicago, has been re-elected president, Chicago Foundrymen's Association.

MISCELLANY: Hamlin-Nagel Inc. has been formed in Edwardsville, Ill. (metropolitan St. Louis) to handle new and rebuilt foundry equipment and to provide engineering service . . . September orders for industrial material handling equipment reached 126.43 on the Material Handling Institute index, nearly 40 points more than the August level, and 41 points above September, 1958. The monthly average for 1954 equals 100 on the index . . . East Texas Foundry & Machine Co., Marshall, Tex., has been purchased and put back into production by Barber Iron Works, Shreveport, La. The Texas company had been out of operation since April, 1957 . . . Primary aluminum production during October totaled 173,762 tons, more than 5000 tons above the September figure and only 5500 tons below the record month, July of this year. The third 1959 quarter was the all-time record quarter, with 520,216 tons produced . . . October orders for 2722 freight cars rose sharply from 945 in September. Orders for October, 1958, totaled only 666.



PRODUCTION WORKERS

Estimated Number

	Aug. 1959	July 1959	Aug. 1958
Ferrous	194,100	197,700	155,900
Nonferrous	52,800	52,500	44,900

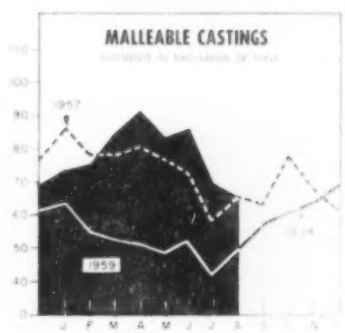
Average Weekly Earnings

Gray Iron	$93.93	$97.51	$84.15
Malleable Iron	95.34	95.82	86.03
Steel	99.18	103.38	91.74
Nonferrous	99.39	99.55	93.60

Average Weekly Hours

Gray Iron	39.8	40.8	37.4
Malleable Iron	40.4	40.6	37.9
Steel	39.2	40.7	37.6
Nonferrous	40.9	40.8	40.0

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1957	751,818	143,991	232,326	373,586	.....
1958					
Aug.	45,034	9,034	14,426	21,505	71,135
8 mo.	372,681	74,815	116,257	180,692	.....
Sept.	52,796	10,261	16,241	26,254	72,819
Oct.	55,699	10,932	17,189	27,511	73,474
Nov.	55,783	10,539	16,942	28,264	76,370
Dec.	59,487	10,874	18,970	29,579	78,732
Total	596,456	117,421	195,599	292,300	.....
1959					
Jan.	68,896	11,238	24,844	32,813	83,314
Feb.	68,381	10,802	25,428	32,147	82,001
Mar.	73,351	12,412	26,964	33,949	82,676
Apr.	72,976	12,700	26,153	33,992	85,636
May	68,268	11,979	25,283	30,877	80,325
June	66,479	12,312	24,927	29,092	81,228
July	56,911	11,581	20,410	24,786	80,450
Aug.	55,769	11,130	17,824	26,683	82,488
8 mo.	531,031	94,154	191,833	244,339	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	For Sale	Standard Total	For Sale	Pearlitic Total	For Sale	Unfilled Orders[2]
1957	862,976	520,118	713,539	431,662	149,437	88,456	.....
1958							
Aug.	49,252	29,414	41,734	24,696	7,518	4,718	55,145
8 mo.	411,102	237,564	340,604	193,943	70,478	42,621	.....
Sept.	56,836	31,999	45,945	26,370	10,891	5,629	58,405
Oct.	60,981	40,014	50,181	31,992	10,800	8,022	63,425
Nov.	63,356	35,221	50,063	28,409	13,293	6,812	66,725
Dec.	68,385	40,041	53,797	32,853	14,588	7,158	65,904
Total	660,650	383,839	540,600	313,597	120,050	70,242	.....
1959							
Jan.	73,186	43,667	56,700	35,139	16,486	8,528	77,322
Feb.	74,760	42,093	57,573	31,976	17,187	10,117	90,291
Mar.	84,335	49,690	67,439	40,515	16,896	9,175	95,822
Apr.	90,974	54,306	75,583	43,835	18,391	10,471	102,508
May	83,472	49,619	66,512	40,438	16,960	9,181	99,879
June	85,497	51,411	68,426	42,453	17,071	8,958	95,339
July	69,184	43,128	55,120	35,787	14,064	7,341	75,252
Aug.	65,062	40,143	53,217	33,224	11,845	6,919	85,852
8 mo.	626,470	374,027	500,570	303,367	128,900	70,690	.....

Prices of Foundry Metals and Coke

(As of Nov. 27, 1959)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	68.50	69.00
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 30.75; tin bronze, No. 225, 41.50; No. 245, 36.00; high-leaded tin bronze, No. 305, 35.25; No. 1 yellow, No. 405, 24.75; manganese bronze, No. 421, 29.25.

ALUMINUM: 99 per cent plus primary ingots 26.80. Secondary No. 12 alloy, 23.75-24.00. Deoxidizing grades: No. 1, 24.50; No. 4, 21.50.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 33.00, delivered Connecticut valley.

ZINC: High grade 13.75, delivered. Die casting alloy No. 3, 15.75; No. 2, 16.00, delivered.

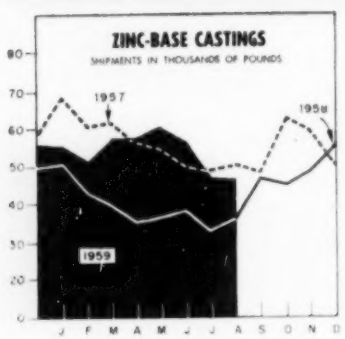
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Melting Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$37.00-38.00	$55.00-56.00	.....	.....	.....	.....	$56.00-57.00
Boston*	**35.00-36.00	**39.00-40.00	.....	.....	**40.00-41.00	.....	.....
Buffalo	39.00-40.00	**47.00-48.00	.....	.....	**51.00-52.00	.....	55.00-56.00
Chicago	45.00-46.00	57.00-58.00	.....	64.00-65.00	64.00-65.00	65.00-66.00	64.00-66.00
Cincinnati*	**38.00-39.00	**49.00-50.00	**44.00-45.00	.....	**59.00-60.00	.....	**63.00-64.00
Cleveland	40.00-41.00	55.00-56.00	41.00-42.00	58.00-59.00	58.00-59.00	68.00-69.00	67.00-69.00
Detroit*	**39.00-40.00	**46.00-47.00	**40.00-41.00	**53.00-54.00	.....	.....	.....
Los Angeles*	40.00	47.00	.....	.....	.....	.....	.....
New York*	38.00-39.00	38.00-39.00	37.00-38.00	.....	.....	.....	.....
Philadelphia	45.00	46.00-47.00	48.00	.....	55.00	68.00	.....
Pittsburgh	41.00-42.00	50.00-51.00	.....	47.00-48.00	54.00-55.00	.....	67.00-69.00
St. Louis*	37.00-40.00	55.00	44.00	56.00	.....	.....	56.00
San Francisco	40.00	48.00	28.00	40.00	40.00	.....	.....
Seattle	35.00	54.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

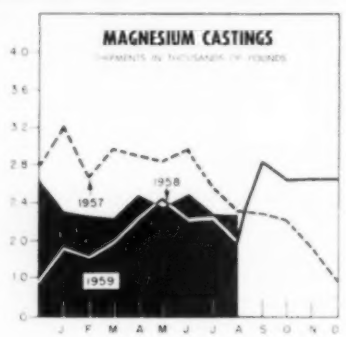
Foundry Statistics



PIG IRON

PRODUCTION**—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1957	2,275,789	3,697,335	7,452,203
1958			
July	123,075	156,582	402,850
7 mo.	871,966	1,315,974	2,690,637
Aug.	141,185	145,216	396,511
Sept.	133,556	234,752	416,026
Oct.	146,386	257,111	575,806
Nov.	175,210	257,131	489,095
Dec.	154,007	272,375	429,299
Totals[3]	1,622,320	2,448,917	4,954,854
1959			
Jan.	190,392	263,105	479,019
Feb.	121,716	258,250	312,284
Mar.	173,881	341,218	412,533
April	159,960	296,384	427,227
May	198,126	358,087	474,820
June	188,158	346,231	441,052
July	.....	.....	.....
7 mo.	.....	.....	.....



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1957	669,775	431,509	.....
1958			
Aug.	35,860	26,971	45,066
8 mo.	311,974	208,857	.....
Sept.	47,127	33,530	50,762
Oct.	45,045	36,193	58,154
Nov.	48,431	34,054	57,864
Dec.	55,600	39,768	56,756
Total	508,177	352,302	.....
1959			
Jan.	55,439	38,661	61,192
Feb.	51,365	35,478	57,437
Mar.	57,600	40,700	62,657
Apr.	57,325	40,127	55,916
May	60,656	43,920	62,224
June	56,128	40,226	54,097
July	46,756	34,606	52,677
Aug.	46,566	34,682	56,090
8 mo.	431,838	308,400	.....

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1957	4,160,891	218,178	246,851
1958			
June	262,883	12,098	15,549
6 mo.	1,619,040	81,662	67,817
July	239,140	10,550	12,140
Aug.	247,428	13,196	32,309
Sept.	300,173	14,994	27,759
Oct.	300,115	17,393	34,273
Nov.	287,913	14,862	31,397
Dec.	321,741	16,610	25,450
Total	3,314,652	169,267	231,145
1959			
Jan.	321,302	17,113	36,783
Feb.	324,876	17,960	37,414
Mar.	353,985	20,625	42,464
Apr.	366,378	21,997	41,597
May	358,192	20,424	40,812
June	366,136	20,390	39,867
6 mo.	2,090,869	118,509	238,937

MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1957	30,322	28,452	.....
1958			
Aug.	1,869	1,808	6,086
8 mo.	16,570	15,550	.....
Sept.	2,804	2,581	6,083
Oct.	2,627	2,479	5,463
Nov.	2,615	2,523	4,063
Dec.	2,612	2,384	5,115
Total	27,228	25,517	.....
1959			
Jan.	2,291	2,086	5,001
Feb.	2,249	1,995	4,637
Mar.	2,129	1,924	4,465
Apr.	2,455	2,213	4,787
May	2,370	2,093	5,102
June	2,484	3,207	4,664
July	2,265	1,875	3,995
Aug.	2,243	1,753	3,809
8 mo.	18,486	17,146	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

NOW YOU CAN BUY DORCHESTER MC* SAND MULLED

CAN'T FREEZE

SAVES MONEY

READY TO USE

Another first! Whitehead's new plant at Dorchester. View shows how sands are processed and loaded on freight cars by equipment of latest design.

Muller of new design manufactured by National Engineering Company

WHITEHEAD'S

* MOISTURE CONTROLLED

AND MULLED

NATURAL BONDED

DORCHESTER MOLDING SANDS

AND GRAVELS

Guaranteed Moisture Content Not Above 6%

With Whitehead's new plant in full operation, Dorchester Molding Sands arrive at your foundry completely mulled, if so ordered. Each grain of sand is evenly coated with its natural bond of clay.

Widely used for Cores and Molds in Iron, Steel, Alloys, and Non-Ferrous Castings, the famous Dorchester Molding Sands are noted for Colloidal clay giving high green and dry strength. Because of the low fines in grain distribution, these sands have a high permeability.

1 ***Moisture Controlled Sands Do Not Freeze—***

a. Easier to unload . . . means lower unloading costs.

b. Reduces handling costs to and from storage bins.

2 ***Moisture Controlled Sands Are Economical—***

a. Sand with 15% moisture have 1700 lbs. sand and 300 lbs. water in each ton.

b. Moisture Controlled Sands with 6% moisture have 1880 lbs. sand and 120 lbs. water in each ton.

c. On each ton of Moisture Controlled Sands you SAVE price of sand and freight on 180 lbs. of water. Sand has just right amount of moisture to eliminate dust hazard.

3 ***Ready to Use on Arrival at Foundry—***

a. Dorchester Moisture Controlled Sands and Gravels arrive with proper working moisture content so that they can be used at once.

b. Aids you in control for sand at foundry.

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Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 582 on Page 53

Need technical or practical foundry advice?

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REPUBLIC'S 3-DIMENSION METALLURGICAL SERVICE

Republic provides a unique pig iron metallurgical service to foundrymen everywhere. This service utilizes the combined knowledge of field, mill, and laboratory metallurgists. It is based on the premise that pig irons behave in different ways, in different foundries, under a variety of operating conditions.

How 3-D Service works for you. The field metallurgist, first man on the team, visits your foundry. He talks to your production people, finds out what their problems are, what they expect the pig iron to do. Being both a practical foundryman and skilled technician, the field metallurgist is frequently able to provide an on-the-spot solution. His recommendations often result in improved operations, increased efficiency, and output at lower cost.

Should your problem involve metals research or chemistry, the field metallurgist checks with the other two members of the service team—the mill and laboratory metallurgists.

All three men then focus their attention on your problem. Their recommendation, based on your objectives, your costs, your equipment, is passed on to your personnel by the field metallurgist. He works with them to see that your problem is solved satisfactorily, right in your foundry.

Why not call for Republic's 3-Dimension Metallurgical Service the next time you need practical or technical foundry advice? Or before you start a new job or an old job with new specifications. This service is obligation-free. The coupon will let us know if you would like a field metallurgist to call.

REPUBLIC METALLURGICAL SERVICE provides a solid foundation for industry's most complete line of merchant pig iron—Chateaugay, Northern Basic, Foundry, Bessemer, and Malleable; Southern Basic and Foundry. With this choice, Republic metallurgists are able to recommend the best and most economical grade for your specific job without hesitation or prejudice.

REPUBLIC PB-127 COLLAPSIBLE BOXES are ideally suited to storing and shipping castings. Heavy-duty corrugated design provides needed strength, delivers long, efficient service at lowest per-year cost. Boxes can be tiered when loaded or empty, collapsed or set up. All parts are permanently attached. The PB-127 Box and Skid Unit offers up to 66% savings in storage space when collapsed. Send coupon for full facts.

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Circle 583 on Page 53

4 NEW SERIES IR GRINDERS

to give you an ANNUAL DIVIDEND on your PAYROLL DOLLARS

NEW *DESIGNS SPEEDS POWER*

NEW

4S Series Grinder

60% more output . . . for $3000 Dividend Dollars/year.

NEW

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25% more output . . . for $1250 Dividend Dollars/year.

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25% more output . . . for $1250 Dividend Dollars/year.

NEW

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17% more output . . . for $850 Dividend Dollars/year.

If your operators are using older model grinders, you can increase their man-hour productivity by as much as $3000 Payroll Dollars in one year, just by replacing the older tools with one of the new I-R designs.

Multiply these *Annual Dividends* by the number of grinder operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R grinders can help you earn in just one year—without adding to your present payroll.

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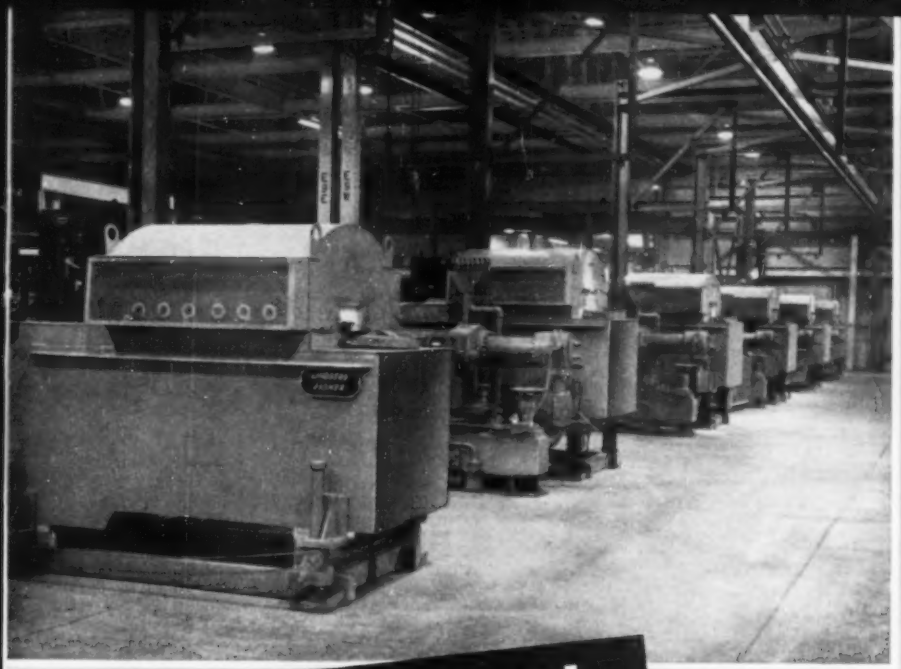
Ingersoll-Rand

Tools plus AIRengineering increase output per man

8-923

Circle 584 on Page 53



Lindberg-Designed

furnaces, more than 75 of them, help Ford Motor Company maintain casting production and quality standards

The new Aluminum Castings Plant of Ford Motor Company, Engine and Foundry Division, at Sheffield, Alabama, is a model of modern production efficiency. Contributing to its effective operation is a huge battery of Lindberg-Fisher aluminum holding furnaces, more than 75 of them. Eight large 65,000 lb. capacity reverberatory holding furnaces receive molten aluminum delivered from an adjacent Reynolds Metals plant and hold it at the desired temperature. Six other reverberatory furnaces, each with 20,000 lb. capacity, are used for remelting scrap aluminum from trimmed parts and holding metal at its usable temperatures. Molten metal is then delivered to more than 60 electric resistance holding furnaces in the casting area as needed. This unique installation, developed by Ford engineers in conjunction with Lindberg, is a major factor in maintaining the high quality product and production standards required by Ford.

Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, melting and holding, heat treating, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

Handsome entrance to new plant of Ford Motor Company, Sheffield, Alabama.

Metal temperatures are positively controlled through Lindberg Control Panel.

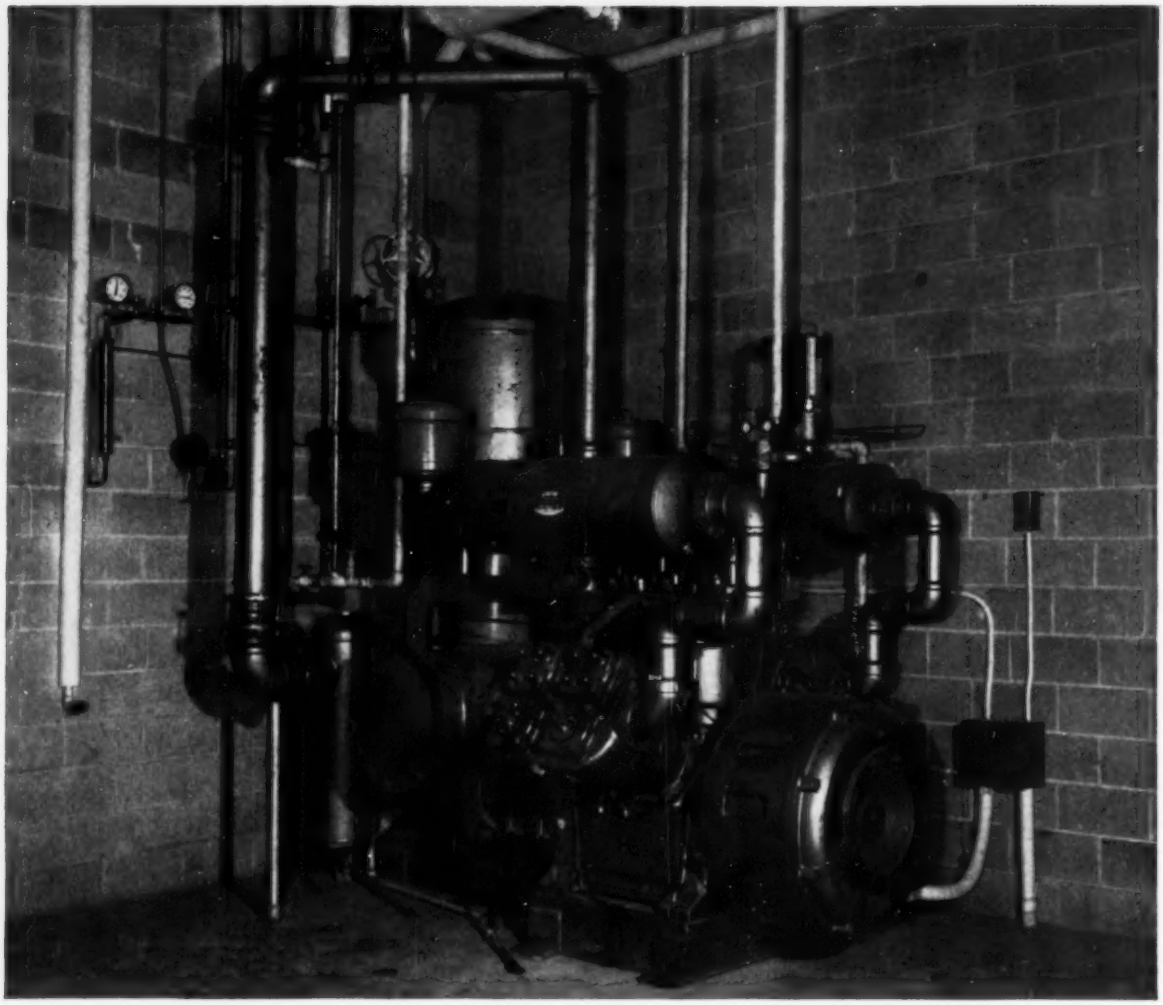
Some furnaces are arranged for hand ladling and others are equipped with Lindberg Autoladle.

Molten aluminum is delivered direct to reverberatory holding furnaces.

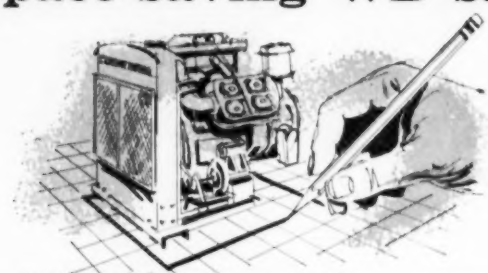
The molten metal is held in these 14 huge furnaces for distribution to the casting areas.

LINDBERG heat for industry

Circle 585 on Page 53



Space-saving WB saves floor-space dollars



SAVING YOUR FLOOR-SPACE DOLLARS—that's one more example of Gardner-Denver Engineering Foresight. Our engineers know your problems . . . design equipment to meet your needs. At Gardner-Denver there's no substitute for men—our 100-year philosophy of growth.

What's the yearly overhead for a square foot of floor space in your plant? That will indicate one of the savings you can expect—year after year—when you install a compact Gardner-Denver WB air compressor. For example, the WBJ displaces 686 cfm—occupies only a $5\frac{1}{2}'$ x $6\frac{1}{4}'$ corner of your plant.

There are eight space-saving WB sizes from 142 to 1150 cfm piston displacement. Each size is a packaged unit that's easily and quickly installed without costly foundation work.

Noted for years of dependable, economical service. And here's one important reason: our workmen keep the machine *clean* during assembly. Write for Bulletin WB-10, or consult your Gardner-Denver compressor specialist.

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Fastest water-borne one-step Phenolic Resin ever developed!

AMRES 1511 is ideal where production speed is vital in hot process sand coating or cold coating equipment with external hot air. Although no sand preheating is required, preheated sand may be used. Its extreme fast cure rate gives excellent tensile strengths without danger of fire or explosion. This remarkable new phenolic resin is now available for fast delivery from shipping points throughout the country.

AMRES 4170 is a new novolac (two-step) resin developed especially for hot sand coating equipment. It may be used in a direct-flame muller without fire, explosion or over-reaction risk. AMRES 4170 has an infinitely stable storage life.

AMRES 4196 (novolac) is perfect where muller heat input is limited. It is excellent in a low volume operation or where coating cycles are not critical. It also has a infinite storage life.

Send coupon today for complete data on these three great new American-Marietta Resins–AMRES 1511–AMRES 4170 and AMRES 4196

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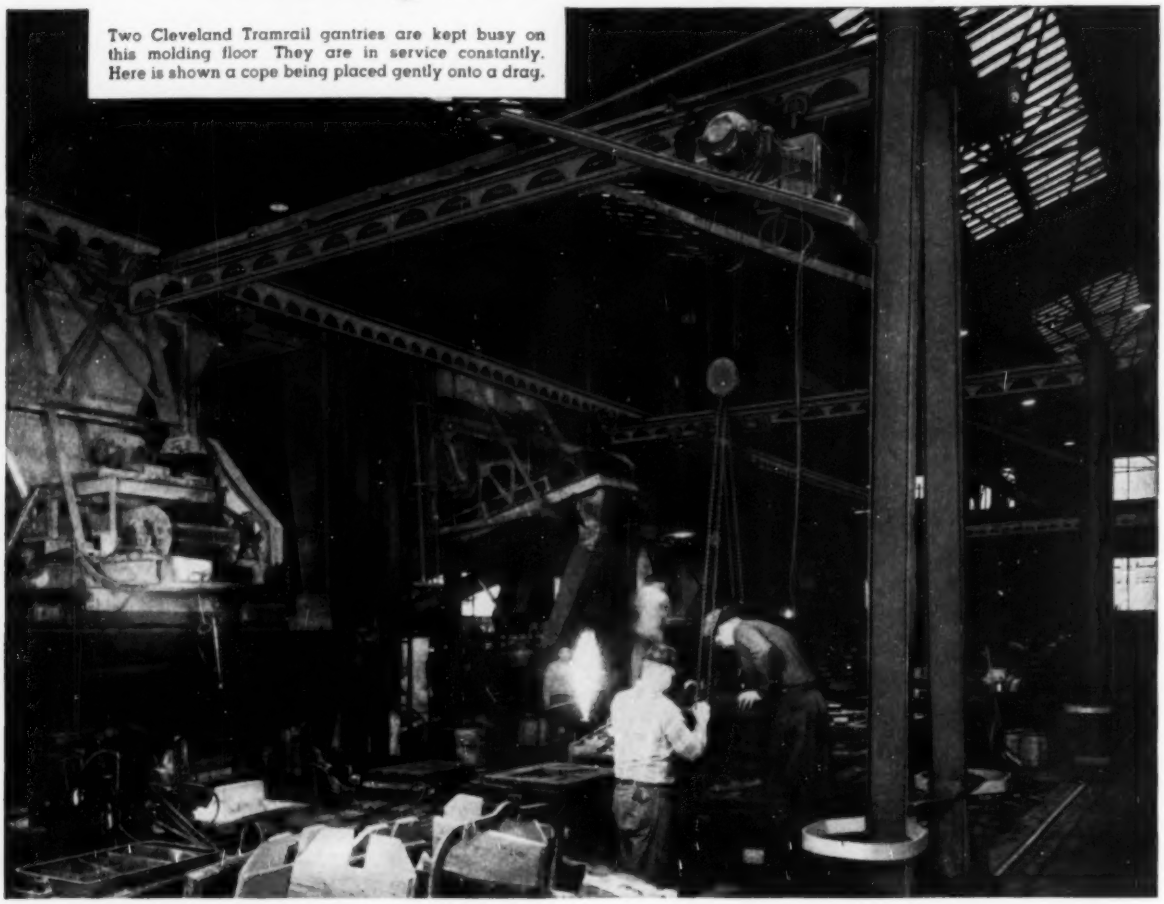
Circle 587 on Page 53

Gantries Expedite Production

For Largest Western Foundry



Two Cleveland Tramrail gantries are kept busy on this molding floor. They are in service constantly. Here is shown a cope being placed gently onto a drag.

FOR many years Cleveland Tramrail gantry cranes have been used for various foundry handling operations at the Pacific Car & Foundry Company, Renton, Washington, whose foundry is reputed to be the largest west of the Mississippi River.

The cranes have proven a tremendous aid in obtaining maximum production and easing the work by eliminating much of the former heavy manual lifting and moving of materials. Because their design permits their operation under heavy overhead traveling cranes, the gantries can be placed wherever lifting and handling service is needed to take care of local work areas.

Gantry cranes are one of many types of Cleveland Tramrail equipment which offer opportunities for foundries to expedite production and make substantial savings.

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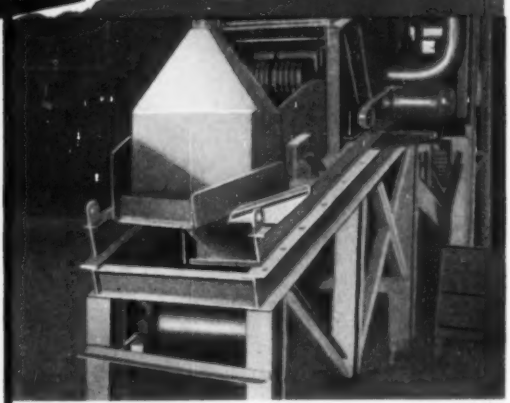
Circle 589 on Page 53

SALVAGE YOUR VALUABLE MOLDING SAND with a SIMPLICITY RING-TYPE CRUSHER SCREEN



188

You profit two ways with Simplicity's Ring-Type Crusher Screens

- Your used core and molding sand is crushed and screened for re-use in one operation, saving the cost of new sand.
- Transportation and dumping costs of used sand are eliminated.

This unit combines the Simplicity heavy-duty vibrating screen with free-turning cast rings mounted over crushing plates. One to three sets of rings can be supplied, depending upon the maximum lump size to be crushed.

Simplicity ring-type crusher screens are paying their way in foundries producing magnesium, steel, malleable and grey iron castings throughout the United States.

Available in many models and sizes. For complete information write today for the name of our sales engineer in your area; and turn your waste into profits.

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ENGINEERING COMPANY • DURAND 7, MICHIGAN

Circle 590 on Page 53

...where a little heat generates a lot of light! We're in Cambridge, Ohio, at VCA's modern Research Center and Pilot Plant. Here is where answers are found to all manner of questions about ferroalloys and their use.

Although the Pilot Plant is only one part of VCA's Research Center, its function is most important to our customers. For here melting equipment of all kinds helps develop new VCA processes and products, in addition to solving direct customer problems. Each year "hundreds of heats" are melted without thought of selling price or profit.

This special service is just another reason why, "There's more in the Vancoram Green Drum than you can ever see!" Let these and other special services go to work for you. Call or write your nearest VCA office. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N. Y. • Chicago Cleveland • Detroit • Pittsburgh

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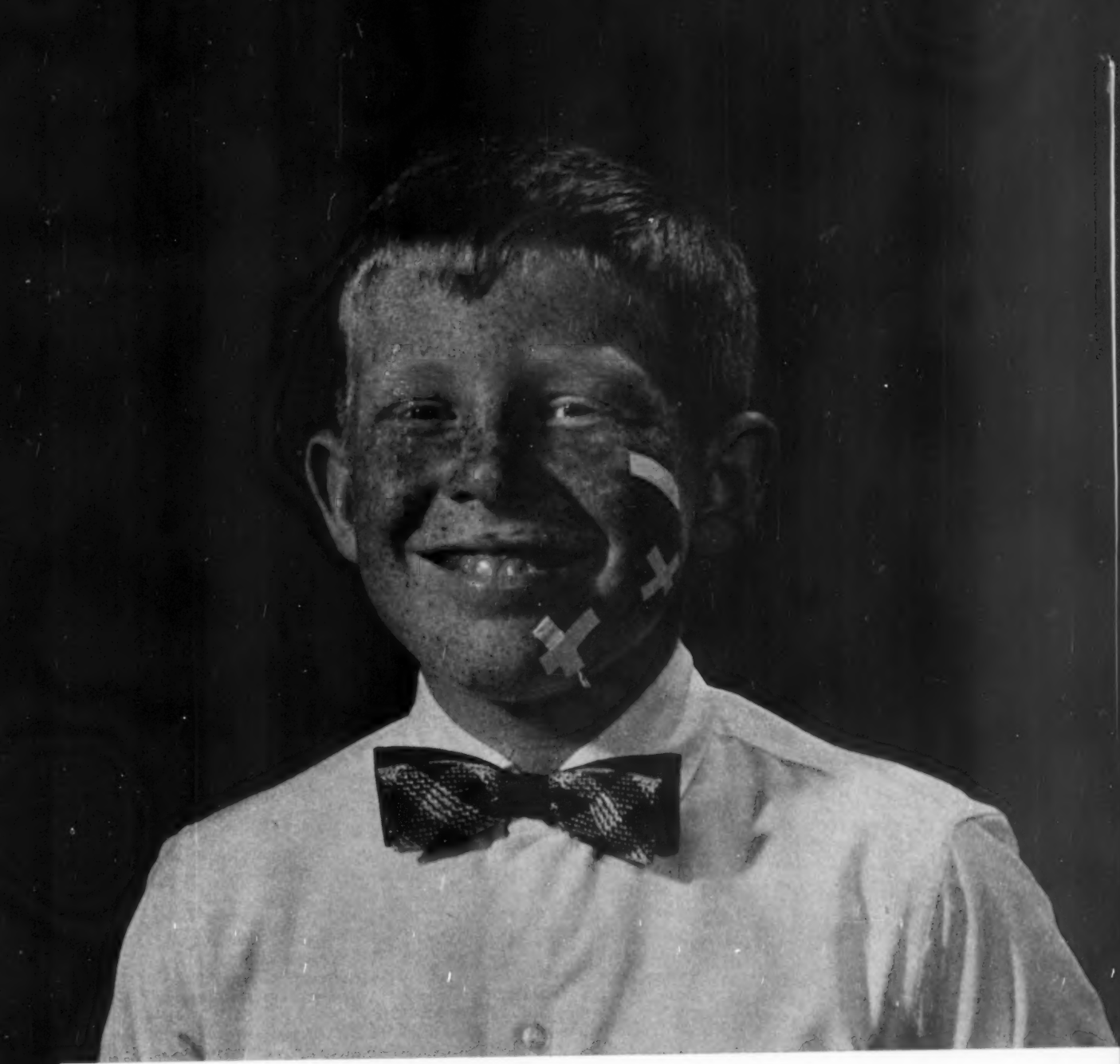
We've been in business for 37 years. We were the first to manufacture steel shot, AMASTEEL, in 1947. We make no other product, we prefer to *specialize* in the manufacture of shot and grit in our electric furnace. More than 25,000 tons a year!

This specialization (experience!), enabled us to develop our secret, two-step quenching process. It makes steel shot and grit of *uniform hardness* with fewer surface pits or cracks. As a consequence, AMASTEEL wears like a pig's nose!

Use AMASTEEL and your machine maintenance will be reduced 60 percent. AMASTEEL cleans faster than other materials, leaves no carbon deposits or metallic residue. Use it, and you can reduce your storage, handling, freight, and dust disposal charges. The savings in your cleaning department can be substantial!



for Experience!

The AMASTEEL engineer-salesman has been into, under and around every kind of blast-cleaning equipment made, for almost as many years as the process has been used in this country. He knows answers to cleaning problems of every description. With the AMASTEEL Process Proving Machine he will test your cleaning operation, supply the right recommendations, and prove them. Right on your desk top! He also has literature describing how AMASTEEL serves other industries like yours. But why wait for his visit? Write or wire for booklet Number 591. It will be sent to you Special Delivery!

AMASTEEL

ALLOY METAL ABRASIVE COMPANY
121 South Division Street
Ann Arbor, Michigan

Circle 592 on Page 53

"Better Finishing, Faster—With AMASTEEL."

ANNOUNCING NEW HEAVY DUTY 6" AND 8" HICYCLE GRINDERS

Heavy Duty Hicycle Angle Grinder with rotating wheel guard.

Heavy Duty Hicycle Angle Sander with 9" pad.

Model CP-550-SG-4500 Heavy Duty Grinder maintains speed under load, lets the operator really lean into the work.

Here are two *all new* CP heavy duty Hicycle Grinders . . . brutes for power, demons for speed. Hicycle squirrel-cage induction motors running on 180 cycles, 220 volt, 3 phase current provide Built-in Overspeed Protection because maximum speed is always constant, always within safe wheel limits . . speed sag under load is less than 15%.

New with these models is the CP *"Tri-Flo" Cooling* System that minimizes "hot spots". This highly efficient system cools motor windings, rotor shaft, main bearings, gear case and switch. Keeps the temperature rise at key points as much as 28° lower than with conventional type cooling.

You get these 7 extra advantages with CP Hicycle Grinders

1–*Hicycle Motor* of advanced squirrel-cage design means no brushes to replace, no armature to burn out. 2–*Power/Weight Ratio* is outstanding because high strength magnesium castings are used for motor, gear case and switch handle. 3–*Oil Sealed Ball Bearings* lubricated for life. 4–*Interchangeable* motors, motor housings, switch handles and switches on all straight and angle models. 5–*Heavy-duty switches* have dust tight seals and phenolic spacers for insulation from motor and to minimize vibration. 6–*Extra heavy micro-mesh gearing* heat-treated for long service. 7–*Guards* fully conforming to A. S. A. safety codes.

Write for complete information on these newest CP Hicycle Heavy Duty Grinders. Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.

Chicago Pneumatic

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Circle 593 on Page 53

New 200-ton Lectromelt furnace swings into service at Republic Steel

This new 24-foot, 200-ton top-charge-type Lectromelt electric furnace is powered for large-scale production . . . built for maximum availability, minimum downtime between heats.

For *your* new melting capacity contact Lectromelt. As the world's most experienced builder of electric furnaces we deliver *performance*. Lectromelt Furnace Division, McGraw-Edison Company, 314 32nd Street, Pittsburgh 30, Pennsylvania.

Circle 594 on Page 53

WHEN YOU MELT **Lectromelt**®

McGRAW EDISON

Why you can't afford cheap nozzles...

BORE OF NOZZLE IN INCHES	CU. FT. OF AIR PER MINUTE @ 80 LBS. PER SQ. IN.	H.P. REQUIRED TO MAINTAIN PRESSURE
3/8	191	34.76
13/32	225	40.95
7/16	260	47.32
15/32	299	54.42
1/2	340	61.88
9/16	430	78.26
5/8	532	96.82

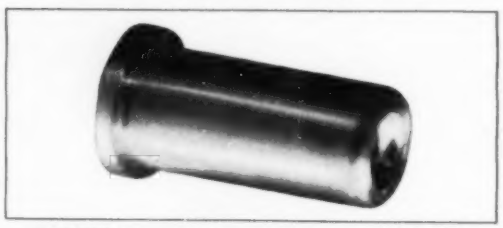
The chart tells the story.

Any pressure blast nozzle which wears rapidly greatly increases your compressed air bill. For example, when you start with a 3/8" bore nozzle at 80 lbs. blasting pressure, it will pass 191 cu. ft. of air per minute, requiring 34.76 H.P. However, when this nozzle has enlarged only 1/16" to 9/16" bore, you must supply 430 cu. ft. of air per minute to maintain the 80 lb. pressure. And you pay for 78.26 H.P. to develop this volume. And with ordinary nozzles, the difference between 3/8" and 9/16" occurs in only a few hours, or when manufactured abrasives are used, this can happen in a matter of minutes!

Now contrast the minimum guaranteed life of Norton NORBIDE* Pressure Blast Nozzles: 750 hours with silica sand . . . 1500 hours with steel shot or grit! Lined with light, tough Norton Boron Carbide — a compound exceeded in hardness only by the diamond — they maintain high-efficiency abrasive velocity *economically* throughout their life span.

Why blast away your profits with cheap nozzles? Get the most work out of both nozzle *and* air with NORBIDE Nozzles. Available with bores from 1/8" to 7/16"; lengths up to 6". For details write Norton Company, Refractories Division 315 New Bond Street, Worcester 6, Mass.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries



NORBIDE Pressure Blast Nozzles cut air costs 10% to 20%.

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FOUNDRY December 1959

401	421	441	461	481	501	521	541	561	581	601	621	641	661	681	701
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760	780	800	820	840	860	880	900	920	940	960	980	1000	1020	1040	1060

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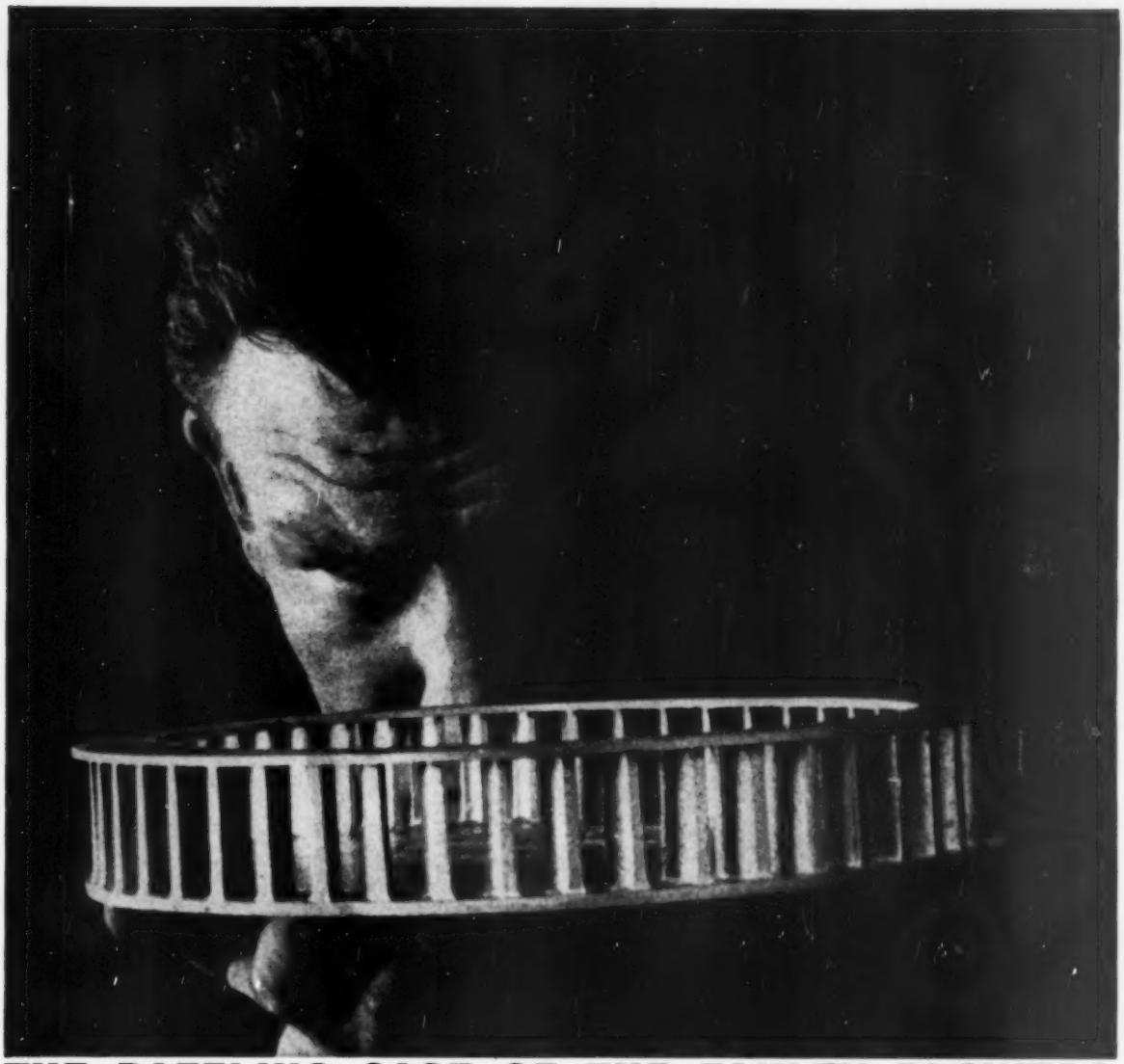

THE BAFFLING CASE OF THE FAULTY BLOWERS

Another costly mystery solved–by the man from Kaiser Aluminum

THE PUZZLING FACTS. A good customer of Kaiser Aluminum had troubles. He manufactured a large blower casting which was to be used at high speeds. But inspection revealed that the casting had numerous cold shuts. The part was unsatisfactory. What to do?

HOW THE CASE WAS SOLVED. It looked like a tough problem, but the man from Kaiser Aluminum found an "out." He discovered that improper gating design was the villain. Redesigning the gating eliminated the difficulty and the case was solved.

WE LOVE A MYSTERY. This is one of many actual cases solved by Kaiser Aluminum working with a customer. Perhaps *you* have a mystery one of our technical engineers might help solve? He's ready to give you expert advice on any casting problem—including mold and die design, alloy selection, heat treatment, finishing, fluxing, metal transfer.

FULL ALLOY AVAILABILITIES. Kaiser Aluminum can supply you *fast* with a wide selection of casting alloys to suit any engineering requirement—from general purpose, low stressed alloys to high purity alloys having good properties at elevated temperatures.

FOR PIG AND INGOT with a free sleuthing bonus, call your nearest Kaiser Aluminum sales office now. Or write to: Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

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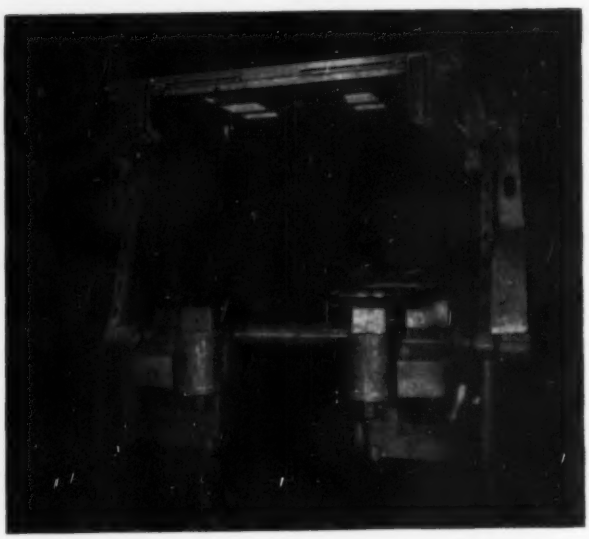

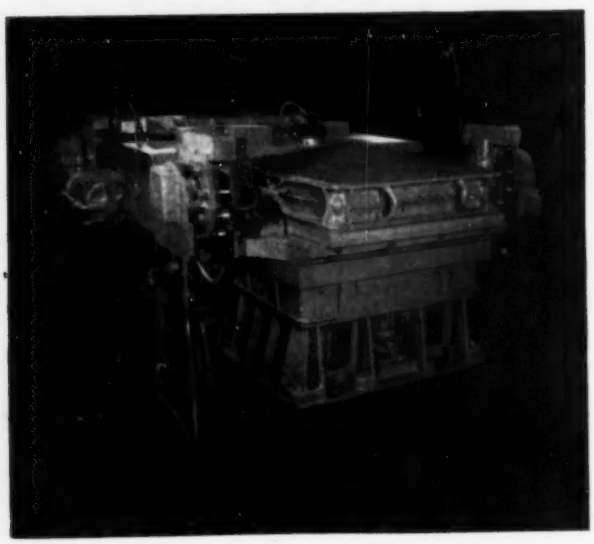

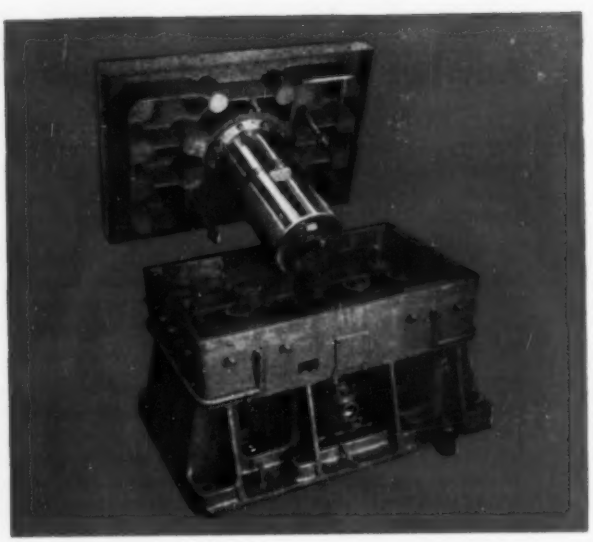

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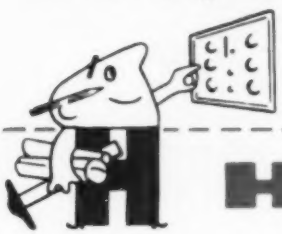

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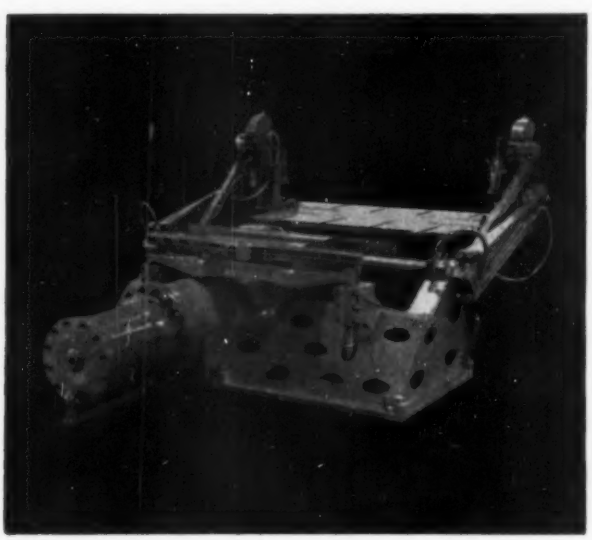

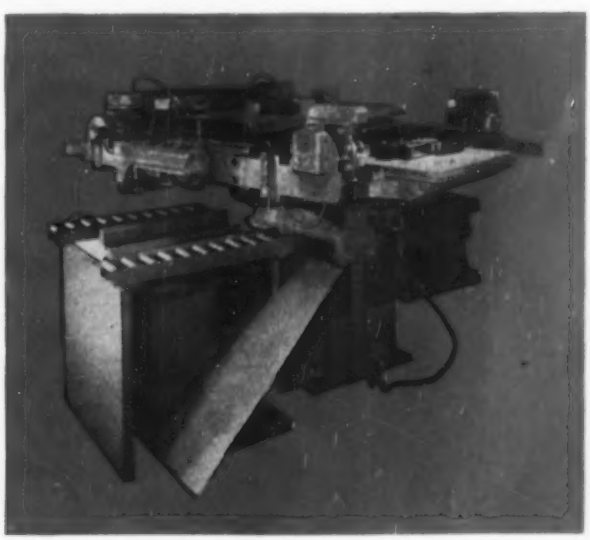

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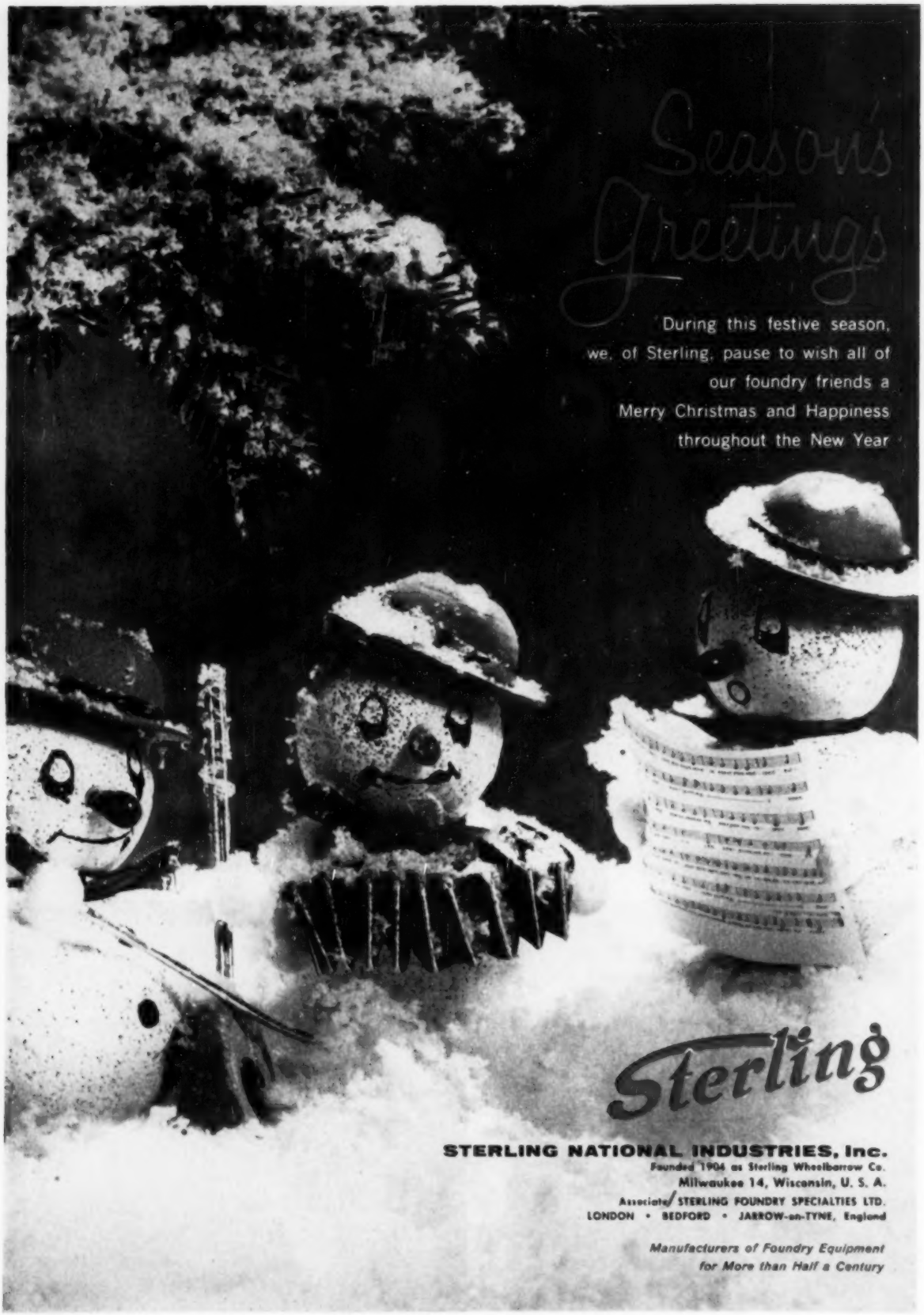
Season's Greetings
During this festive season,
we, of Sterling, pause to wish all of
our foundry friends a
Merry Christmas and Happiness
throughout the New Year
Sterling
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Founded 1904 as Sterling Wheelbarrow Co.
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Make It Clear

How are your communications? As the manager of an industrial company, are you keeping supervisors and foremen completely informed on company policy, procedures, and the changes which may be made in this area from time to time? Do they understand why these policies are to be followed?

As supervisors and foremen, do you understand thoroughly what the company is trying to accomplish, and what you should and should not do? Are you applying basic company policies to the handling of people under you, so that friction may be minimized and the job of production accelerated?

In the course of a year our editors attend many meetings where both management and production problems are discussed. Listening to these programs leaves us with the strong impression that the foundry industry has made much greater progress in the field of technical and production development than it has in matters of management and human relations.

The problem of communicating ideas on policies, plans and procedures too often remains unsolved. Employees do not understand, neighbors do not understand, and the community does not understand. As a result, the company suffers in grievances that may develop into strife and bitterness, in lower production, in unnecessary delays, in higher costs and lower profits.

A. B. Schwarzkopf, addressing the annual meeting of the National Foundry Association in New York on "Foreman Training in Labor-Management Relations," emphasized that the foreman must be kept informed with negotiations, must be provided with data on the key portions of the contract and with labor law as it affects his job, must have knowledge of how to handle gripes before they develop into grievances, etc. This is only one phase of the foreman's operations where complete knowledge from top management is necessary.

Why not take a look at your own organization? Do you have a working plan that really disseminates information to the proper key people in your organization, or do you expect your thinking and planning to follow down through the process of osmosis?

Let's not have supervisors, foremen or the workers lamenting, "If I had just known. . ."

Frank G. Steinebach
Editor

The Total Engineering Approach to . . .

Furnishing Cast Parts

Here's how one foundry helps its customers develop the most efficient cast parts. It offers complete design, laboratory, and engineering help, a choice of four molding methods, pattern-making, heat treating, inspection, and machining facilities

By ROBERT H. HERRMANN
Associate Editor

Co-ordination between engineering and foundry production departments focuses the know-how of the organization on accurate, quick solutions to production problems

● THE MODERN CONCEPT of applying the total facilities of a foundry to development of an engineered cast part is typified at Oberdorfer Foundries Inc., Syracuse, N. Y. This company offers a customer complete design, laboratory, and other engineering facilities plus a choice of four molding methods, patternmaking, heat treating, inspection, and finish machining facilities. The foundry melts aluminum, brass, and bronze.

About 80 per cent of the castings produced in green sand or shell molds result from engineering and development meetings with customers. Twenty per cent of production develops from customers who bring in patterns. Nearly all permanent mold and diecasting work results from development sessions with customers.

Getting the Business—Oberdorfer has geared its foundry to the production of highly intricate, unusual cast parts and long production runs of commercial castings. To get that kind of business, the sales control department systematically surveys 75 per cent of the available aluminum castings market in the United States. Original data for this endeavor were gathered by researching all available sources of information as to where this type of business is and how much is available.

Data were broken down by type of casting and type of industry for county areas and were recorded on punch cards for use in an electronic computing machine. Each salesman's territory is made up by grouping counties into a geographical area. On the basis of data collected, sales efforts are directed at the type of casting business desired.

Data on the punched cards are kept up to date by continual research and information recorded by salesmen on comprehensive sales reports. Those data are recapped periodically to determine whether the kind of coverage the sales department is getting is following the planned effort. Reports are sent to salesmen as a guide to their activities. Periodic recapping of the data also shows sales trends which may indicate a changing market and the need for greater coverage to increase sales.

Company salesmen are trained sales engineers who can discuss design and engineering problems with customers. In addition, salesmen may call on anyone in the foundry to help a customer with a design, engineering, or production problem. Furthermore, salesmen are directed to bring the research facilities of the foundry to the attention of the customer for his use in product development. Copies of quotations on casting jobs are sent to the salesman, and he revisits the customer to determine whether all his requirements are covered properly by the quotation.

Close scheduling procedures for casting orders through foundry departments helps maintain efficient, balanced production

A detailed engineering analysis is given each casting job to provide the customer with advice on design, alloy selection, and production methods

Preparing a Quotation—Requests for quotations are handled by the production engineering department, which is responsible for all methods and tooling. The first decision is to select the molding method to be used. That choice, based on casting complexity and production quantities required, is made by the production engineers from the sand and metal mold foundries and the chief metallurgist. Then additional men are called in to work out design, engineering, and production considerations. These men include a design engineer, the chief estimator, and supervisors of the laboratory and quality control department.

If the job is to be molded in sand, the patternmaking engineer and superintendents of the molding, coreroom, and cleaning departments participate. If metal molds are to be used, a mold designer and the head of the permanent mold and diecasting plant are called.

All engineering and production

considerations peculiar to the job are discussed, and estimated costs for each facet of the work are assembled. Included are factors of molding, coremaking, cleaning, melting, quality control, production quantity, scrap rate, shipping, overhead, and sales and administrative expense. These data are incorporated on punched cards which are run through the electronic computing machine to arrive at an estimated price to be used in the quotation.

Use of the machine reduces both the time necessary and possible inaccuracies involved in hand calculations by an engineer. In addition, punched card data can be stored neatly and are readily available for future reference. Because data can be reviewed quickly to compare estimates with actual costs, the system permits close administrative control and results in minimum selling cost.

Production Management—When a job is placed with Oberdorfer, the same group of men who prepare the quotation meets to review customer requirements and production methods. Designs are set for the casting, and the tooling is designed to produce dimensionally and metallurgically consistent castings. Complete specifications are marked on the drawings before they are turned over to the patternmaker or diemaker. If loose pieces or segments are required, their exact location is specified and any other information concerning the needs of the job is given.

Quality control department personnel continuously check sample production castings for discrepancies or deviations from standards

The laboratory supervisor sets up metallurgical and x-ray standards for the part. X-ray cost is charged to the customer separately or included in the total cost of the job, the choice being a mutual agreement.

Metallurgical considerations involve recommending the best alloy to achieve the desired properties for the cast part. Gating techniques are decided on with the foundry supervisor. Heat treatment practices and metallurgical inspection procedures are under the control of the laboratory, personnel of which are associated closely with the production line and are available to spot and solve metallurgical problems.

In addition to x-ray facilities, the laboratory is well equipped for chemical, metallurgical, and sand

A technical group composed of engineering, production, and metallurgical personnel review a casting problem and recommend action to eliminate it

Data on equipment, materials, processes, quality variations, and customer experience with the castings are filed for each job

testing as well as research. Furthermore, an extensive library of technical books and periodicals is maintained for reference.

Production Control—The production control manager receives a copy of the order describing the tooling and determines on which machines and on which line the job will be produced. He also sets production rates based on scheduling with the superintendents of molding, coremaking, melting, cleaning, heat treating, inspection (including x-ray), and shipping departments. In many cases scheduling is set up as closely as a given hour of a given day.

Once production starting time is set, daily production schedule sheets are sent to department heads a week in advance. Information on the schedules includes the pattern or job number, alloy, quantity of castings, piece weight, total quantity weight, and scrap allowance. Information on status of the job is fed back continuously from foundry department superintendents to the production control department. That information is recorded so that an up-to-date record of a job's status is available at all times.

Quality Control—Control of casting quality starts before the job gets in production. All pattern or metal mold equipment, whether supplied by the customer or built according to Oberdorfer specifications, must be approved for production by the foundry's engineers. Sample castings are made and x-rayed. If necessary, gating is modified to improve results obtained in sample castings. A sample casting from each job is laid out to be sure that it meets all specifications; an approved casting then is sent to the customer for his okay.

All customer specifications and requirements are recorded and filed in the inspection department for reference by inspectors. Production castings are checked on a sampling basis, and visual inspection is routine. In addition, depending on the casting, emphasis is placed on dimensional tolerance, pressure tightness, a check of production variables such as pouring temperature—anything which might affect the specifications and quality of the casting involved.

For every job, inspectors record production data, scrap rates, and any customer complaints with notations as to how the complaints were handled. Foundry department supervisors refer to the data when a job is reordered.

Scrap meetings attended by quality control, laboratory, and production department heads are held every morning. Castings returned by customers also are observed at the meetings, and remedial action for any cause of scrap is established at these meetings.

Part of the quality control program involves periodic visits by foundry management level engineers to customer plants. These visits may be made on a good-will basis to determine whether customers are satisfied and to offer the foundry's engineering facilities to the customer for help in any project he is considering. Visits also are made in response to customers' requests to solve a problem.

Production engineering depart-

This green sand mold-half, made in a jolt rollover machine, produces the fluted face of aluminum building spandrels

ment personnel follow each job through design, engineering, and production. Any changes from the original planning that might improve the casting or facilitate production are discussed and put into effect if considered desirable. Engineers of the department work continuously on better casting design and on improving production methods to reduce unit cost.

Finished Cast Parts—Many castings produced at this foundry are furnished to the customer as finish-machined parts ready for use in their intended application. This is true particularly of diecast and permanent mold parts, which comprise a substantial volume of the castings produced at Oberdorfer.

Company management foresees a trend to customer demand for engineered castings furnished as finished parts rather than as semi-finished castings. Development of such parts requires closer co-operation than usual of user, designer, and foundryman. The furnishing of finished parts places full responsibility for their production with the foundry. In many cases this arrangement will give foundrymen more responsibility in choosing production techniques to make a part that meets customer requirements.

Here's an Example — Currently, the foundry is producing sand-cast aluminum spandrels for a 46-story building now under construction in New York. Oberdorfer engineers worked with the construction division of a large aluminum supplier in designing the spandrels. The foundry is responsible for having the spandrels anodized and for delivering them ready for installation to the construction site in weekly shipments of the assorted sizes needed for one floor of the building.

Forty-six sizes of spandrels are required, ranging from 3 ft, 9 in. x 4 ft to 4 ft x 9 ft, 1½ in. All are 7/16 in. thick. Quantities in the various sizes range from 4 to 2624 pieces, and the total job amounts to about 6000 spandrels. Weights of the units vary from 90 to nearly 200 lb.

The exposed surface of the spandrels is fluted, and the back is smooth and flat except for the mounting flanges. All 46 sizes are made from seven basic pattern segments. These segments are metal for the large-quantity runs and wood for the smaller runs. Green sand molds are used, those for the smaller runs being rammed by hand and the larger quantities being made on jolt rollover machines. The spandrels are made of 43 aluminum alloy with about 5 per cent silicon and the balance aluminum.

Poured castings are taken from the molds and carried by fork lift truck to the cleaning room for degating on a bandsaw and grinding of the gate stubs. The castings are given a normalizing heat treatment to improve machinability and to avoid streaks in the anodized surface. After normalizing, the spandrels are hand straightened to ±1/16 in.; then the fluted surface is blast cleaned and the panels restraightened.

One side of the back support flange and the matching lip forming the bottom edge of a window frame are machined. Holes are drilled to receive stainless steel, self-threading bolts which hold the spandrels to building support members.

Spandrels are steel strapped, two to a bundle, face-to-face, with a piece of cardboard between them. They are shipped in truck-load lots to the anodizing company, where they are anodized and a peel coat of protective material sprayed on the faces.

Spandrels then are rebundled face-to-face and loaded back on the same truck for shipment to the building site. The protective coating is peeled off after the spandrels have been installed.

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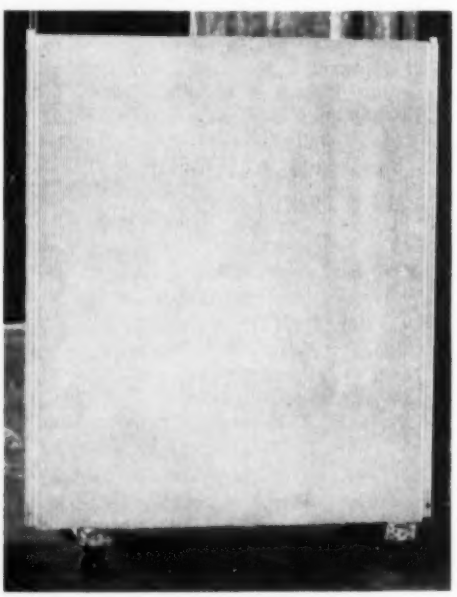
Backs of the spandrels are smooth as shown by this segment being lifted from the mold

Finished spandrels are blast cleaned before shipment to another plant for anodizing



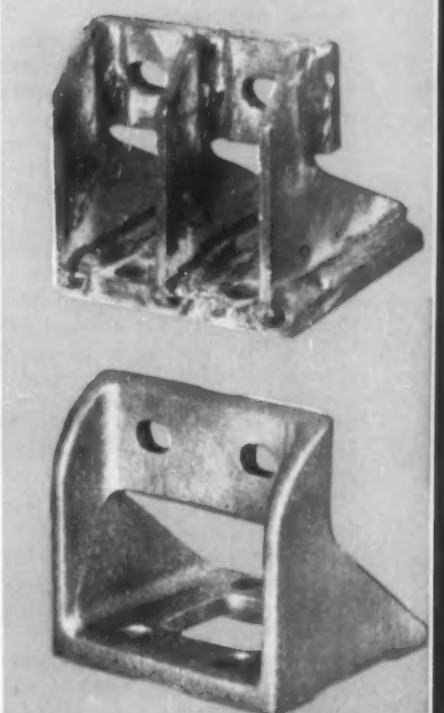
Castings' Role in

MODERN DESIGNS

Castings offer designers a means of matching shape and form of a part to its task. For many shapes, the casting process is the simple and direct route from melt to functional part

Illustrations courtesy of Chrysler Corp. (top) and Ford Motor Co. (bottom)

Fig. 1—Steering gear housing and hanger exemplify freedom of shape possible in castings



Photos courtesy Caterpillar Tractor Co.

Fig. 2—Brackets are a welded fabrication (top) and a casting shown at the bottom

● EVERY PART has shape. There are many methods of producing shapes: Casting, forging, machining from bars, rolling or extruding sections, forming sheet metal, compacting and sintering metal powders, assembling standard wrought forms, and many others.

Many parts automatically fall into a particular production method because of their shape. The malleable iron steering gear housing and hanger in Fig. 1 seem intrinsically compatible with the casting process. On the other hand, many deep-drawn, thin-wall parts seem most suitable for press working of sheet.

Between the extremes, some cases are twilight applications where the designer has great latitude to select the optimum shape - producing method for the total design need. In these latter cases, the casting process has some unique advantages that merit study.

Design Adaptability — Castings can be and look to be functional, rather than primarily reflect manufacturing method. The point is illustrated in Fig. 2.

The closer the distribution of the material in a part matches the flow of stress, the more effective is the performance of the part. At the same time, the part looks fitted for the task it has to do.

To the casual glance, the cast-

ing in Fig. 2 indicates function, integrity, strength related to task. But the fabricated part seems to suggest blanking, shearing, and welding of steel sheet. In some cases, these visual reactions may agree with the engineering facts. Shape, size, and metal efficiency in a casting of this type actually reflect the needs of the design, not the sheet sizes and shop processes available to the designer.

The casting process most nearly lets the designer match shape and form to the task of the part. For example, it becomes a simple matter to taper a beam-like projection to hold uniform stress with a varying moment. A generous fillet is natural in a cast part, giving up to a three-fold increase in endurance life when compared with the sharper corner natural to other processes. High stresses in bearings are readily avoided with bosses, giving not only improved service but also the appearance of design integrity. Even inertial stresses can be controlled easily by reducing the mass of an overhanging member.

The greatest convenience in designing with castings probably is the ease of controlling deflection. Most common designs are limited by permissible deflection rather than by permissible stress. The casting process permits judicious adding of material at efficient points rather than increasing the section of the entire part.

Minimum Model Delays—In the life of most mass-produced parts, a well-known sequence occurs: 1. Design concept. 2. Layouts and details. 3. Experimental model—with changes. 4. Manufacturing model—with changes. 5. Pilot manufacture. 6. Release for production. 7. Later changes related to service, market, etc.

The problem is the time and cost for model changes. The cost of even temporary forming tools will sometimes force a compromise in the model stage. With castings, the model patterns can be inexpensive loose wood patterns. Their versatility permits low-cost, rapid model changes, as many as are needed for a complete model development.

Even after a part has been in production, pattern changes usually are simpler than corresponding tooling changes for the various other possible methods of manufacture.

For many shapes, the casting process is the simple and direct route from melt to part. Cast designs avoid complications. Equivalent assembled parts require specifications, sources, inspections, and information on each detail. With the cast design, there is only one component, source, detail, and inspection, with responsibility concentrated at one point.

A unique advantage of the casting process is the ability to make intricate internal surfaces. This is done, of course, by placing sand cores in the mold cavity to produce internal surfaces. This process allows re-entrant, complicated shapes that would be quite costly or impossible by other manufacturing methods.

Comparing Methods—For some manufacturing processes, the step from final design to initial production may be a costly one because production quantities may be small. A Purdue University thesis[1] study covered this factor in investigating the cost of manufacturing a simple shape by different production methods of different materials. Cost information was obtained by sending uniform inquiries to 250 companies that were in the business of actually producing parts similar to the one covered in the study. The inquiry covered quantities from 100 to 100,000 pieces, thus obtaining information both on small initial quantities and on long production runs.

Fig. 3 is drawn from data in the illustration of the cost study thesis. These data show strikingly the low costs for small, initial quantities by the casting process. In small quantities, all other processes were at least three times as costly as malleable castings, and approximately

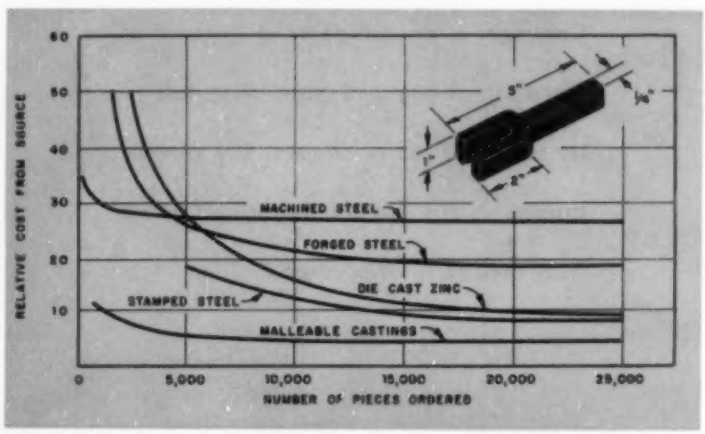


Fig. 3—Data on quoted piece costs for various production methods. Figures plotted are for the clevis sketched, in quantities shown

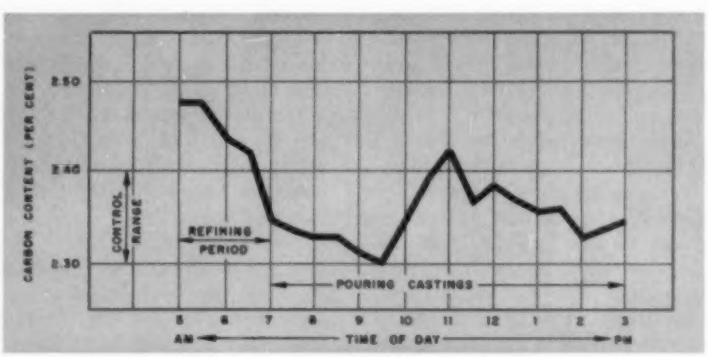


Fig. 4—Plot of carbon control in malleable castings—typical record of analyses made to control quality of metal as tapped from the air furnace

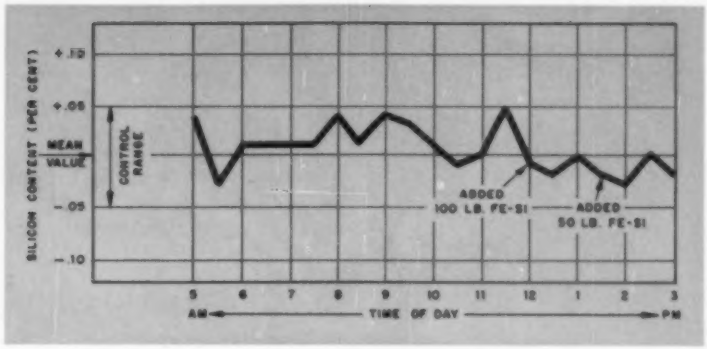


Fig. 5—Plot of silicon control in malleable castings—daily record of silicon analyses which were made on metal tapped from the air furnace

the same relationship would hold for pearlitic malleable.

The part studied was amenable to all processes, and the findings could be different for a radically different shape. Several of the manufacturers emphasized in their replies that the costs quoted were for the rough part as they would furnish it, and this factor should be recognized in evaluating the relative costs by the different production methods.

Modern, straight - line casting processes fit in well with statistical quality control methods. The straight-line practices in member plants of the Malleable Research and Development Foundation typify today's production foundry. Quality is rigorously established when statistical quality control methods are applied to the modern foundry operation.

With the casting method, the melt is "under control." Molding and coremaking are "under control." The melt directly enters the mold.

Thus there are no nonintegrated mill operations, no ingot or billet storage, no warehousing of bars, no in-plant general stockrooms, no in-plant handling of subcomponents. The direct, integrated, concentrated source of the casting process ideally matches the needs of modern statistical quality control.

Quality Control — Examples of foundry quality control impress technologists from other fields. Take the case of the two most important elements in pearlitic malleable—carbon and silicon. Literally hundreds of determinations are made each day. The foundry plots these data as in Fig. 4 and 5, allowing the melter to predict changes before they occur and make appropriate process adjustments. Relentless quality control is justified, because the output of the refining furnace *is* the castings; it is the only metal in the plant; there can be no "mixed materials."

Quality does not result from chemical composition alone, since the control of final mechanical properties also is important. Fig. 6 is a typical control chart for Brinell hardness of pearlitic malleable iron. The modern foundry offers an ideal opportunity to combine melt controls with heat treating controls in predicting controlled mechanical property levels.

In a unique fashion, the pattern equipment establishes a fixed relationship between important dimensions that might be subject to independent variation in other manufacturing processes. It concretely embodies design developments, fixes soundness controls such as risers, and assures reproducible interchangeability. The pattern equipment remains aloof from personnel changes, afternoon fatigue and assembly errors, automatically "locking-up" variables that other manufacturing methods would find it necessary to control on each production run.

At the same time, authorized engineering pattern changes are less costly than comparable changes for other production methods. This flexibility allows the design engineer welcome freedom to adjust his design to new service conditions or new markets.

The directional properties of wrought products require attention and control so that high stresses do not coincide with directions of weakness or segregation. Because castings are not worked (rolled or forged) they do not have the inherent directionality caused by working.

REFERENCE

1. Bergren, C. Walter, "Some Aspects of the Cost Factor in Design for Production." M. S. Thesis in M. E., p. 69, Purdue University (1948).

Editor's Note: This article is one of the chapters of *Modern Pearlitic Malleable Castings Handbook* published recently by the Malleable Research and Development Foundation, Granville, Ohio.

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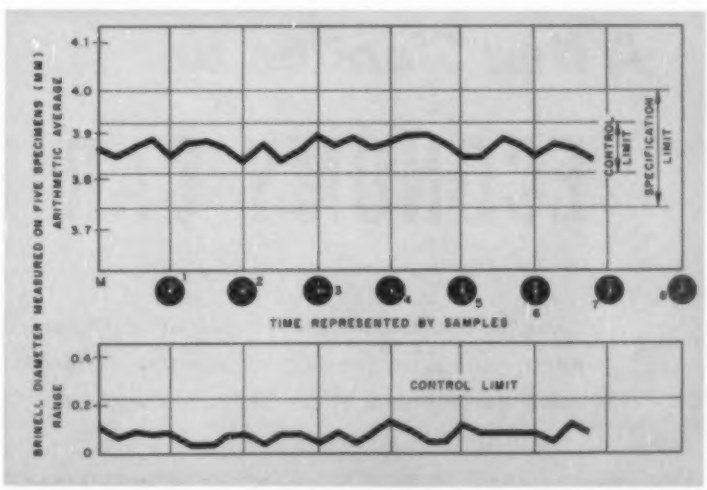
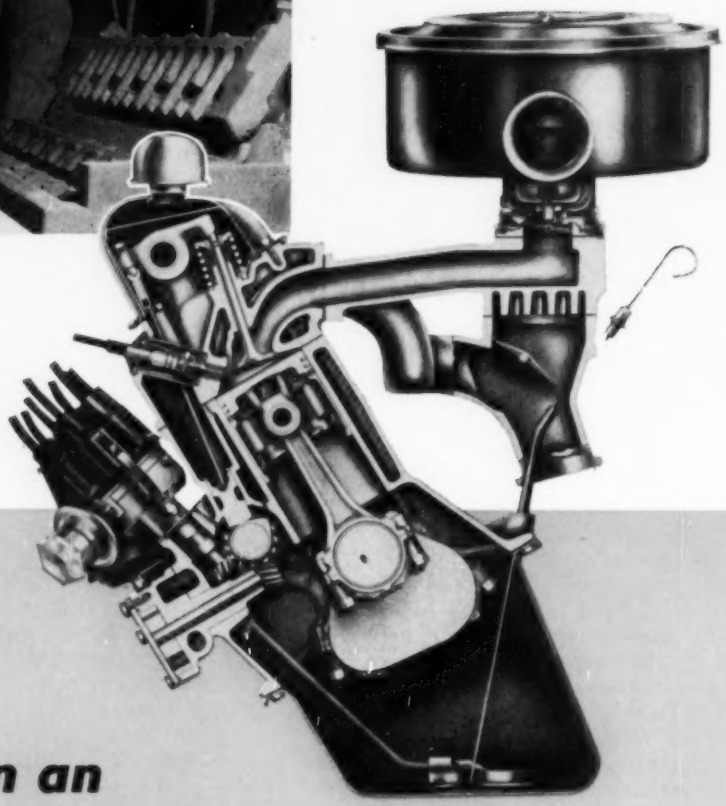


Fig. 6—Section from a chart for quality control of tempered castings. Hardness uniformity is computed from the hardness average and range measured on samples for each lot. Testing time interval is 15 minutes

R. S. Rarey, assistant chief engineer, engine design, left, talks over head coring with Roy W. Vorhees, right, manager of the iron foundry



Cutaway view of the canted engine. It is an overhead valve, in-line, water-cooled, six-cylinder power plant, delivering 101 hp

A New Slant on an

ECONOMY CAR ENGINE

Close co-operation between engine designers and production engineers, plus a background of economy car engine research, permitted quick development of the Chrysler Corp.'s new Valiant engine

By ROBERT H. HERRMANN
Associate Editor

Ralph Schowalter, foundry engineer, left, examines exhaust manifold with Walter Olsen, metallurgist and foundry quality control manager

Barrels on the slab core are hollow to reduce the weight and aid removal from the casting. Plugs are pasted into ends to prevent metal from entering

● THIRTY DEGREES of slant from the vertical is a distinguishing feature of the new six-cylinder engine which powers Chrysler Corp.'s Valiant.

Several reasons account for the slant design. It was necessary to make the engine shorter and lower because these are important factors in a compact car. Shortness is achieved by placing the water pump at the side of the block instead of in front. The slant of the engine reduces the height.

Because an important goal of compact cars is fuel economy, Chrysler engineers designed an unusual, permanent-molded aluminum intake manifold and a sand-cast gray iron exhaust manifold with large radius curves. This manifolding requires extra space, and the slant design provides that feature as well as a lower center of gravity for the car and easy access to accessories.

Canted engines are not new to automotive usage, being employed in some European cars. Also smaller cars and engines are not new to Chrysler. The company's engineers for the last 25 years have designed and tested many types of engines, transmissions, and other components for possible use in small cars. Because of this development work, Chrysler engineers were able to assemble a wealth of information quickly to put the new gray iron block engine into production.

Castings Design — Cast engine components were designed with close co-operative effort of engine designers and engineers from the gray iron foundry, aluminum die-casting plant, pattern department, and the machining plant. Meetings were held at least once a week during development of the engine. Suggestions from all concerned were recorded and considered by the design engineers. In addition, an engineering department liaison man worked continuously with the pattern and foundry departments.

The goal was to design lightweight cast parts, making best use of metals for proper strength and serviceability. Wooden models and patterns were made early in the program and changed as engine development proceeded. Chrysler engineers feel that lead time is gained by this process.

In the opinion of R. S. Rarey, assistant chief engineer, engine design, very little trouble was encountered in casting the first production engine castings because of the fine co-operative effort in development work.

Two basic engines are made from several common parts. The Valiant engine has a bore of 3.40 in. and stroke of 3.125 in. for 170 cu in. displacement and 101 hp. The block is heightened 1.62 in. for the Plymouth and Dart engines. Thus the bore is the same but the stroke is 4.125 in., displacement 225 cu in., to provide 145 hp.

Engine Block—The Valiant block weighs 155 lb as shipped from the foundry. It is designed with 3/16-

Lower and upper water jacket cores are pasted and assembled in a jig

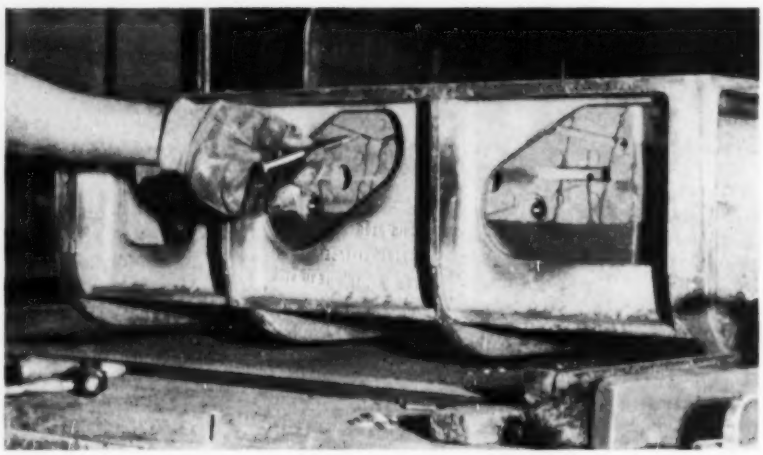
crankcase cores, lower and upper jacket cores, two jacket vent cores, oil galley core, and fuel pump core.

Head—The head is designed with minimum volume water passages to increase the velocity of circulating coolant and thereby obtain optimum cooling. The head weighs about 70 lb as shipped. Two are cast in a green sand mold containing 24 oil sand cores weighing 106.1 lb. The 12 cores for each head include a slab core which forms the six combustion chambers, six rail lightener cores to form the upper portion of

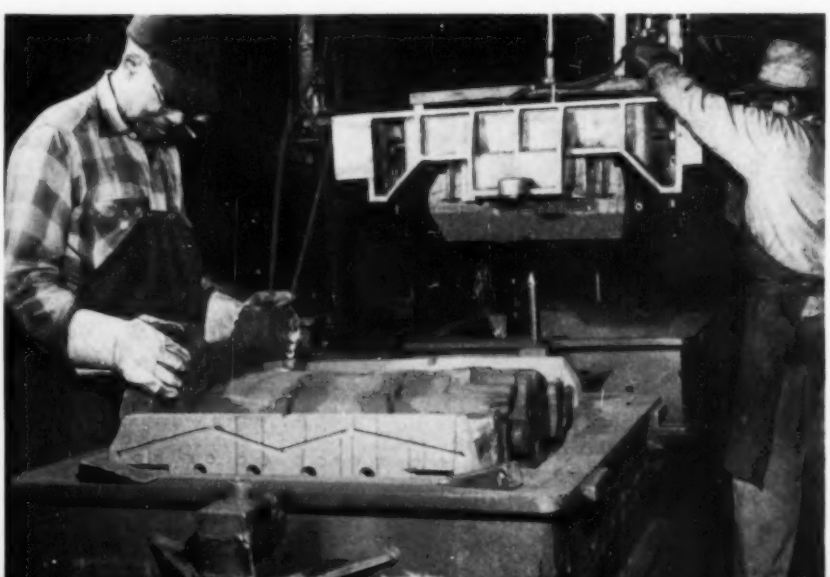
in. wall sections which are thickened at flanges and other points where greater resistance to stress is required. The water pump impeller housing is cast integrally with the block. This arrangement eliminates two gaskets, an oil pan sealing ring, a set of rubber seals, six bolts, the necessity of drilling and tapping six holes, and the previously required assembly operations.

The timing chain back-up plate is replaced by an extension on the cylinder block to eliminate six tapped holes, seals, and assembly work. In addition, an improved sealing condition exists. The valve push rod chamber is cast into the block. Consequently, there is no need for a cover plate, gasket, bolts, bolt holes, and assembly operations. Because the valve push rod chamber is open to the crankcase, an oil breather outlet is incorporated in the cylinder head cover, making a cored opening in the block unnecessary.

Two blocks are cast in a green sand mold, and each mold contains 22 conventional oil-sand cores weighing 279.9 lb. The 11 cores for each block include a barrel slab core which forms the six cylinders and push rod chamber, front and rear lightener cores, three



Jacket core assembly is bolted to barrel slab core and vent tubes inserted. Worker drives nuts on the bolts and wedges into vent pipes



Worker at left sets lightener core. Each mold has 22 cores and produces two blocks

The 12 cores for the head are assembled along a slider belt. Assembly is checked with gages

above the common outlet of the exhaust manifold to utilize exhaust heat for warming the fuel-air mixture.

Aluminum castings are used for other engine components in an effort to minimize engine weight. These diecast parts include a water pump bearing support body, a combined oil pump body and oil filter pad, a water outlet elbow, a distributor housing, and the alternator housing. Pistons also are cast of aluminum as is the case with most automotive engines.

● For an extra copy of this article, until supply is exhausted, use card on Page 53

the push rod chamber, two port cores, each forming six ports, lower and upper water jacket cores, and a thermostat core.

Exhaust Manifold—Gray iron exhaust manifolds are cast two in a mold and weigh about 21 lb each as shipped. The coring for each manifold involves a 7-lb body core, which forms wide radius passages from each port, and a collection runner which increases in size at each of the port entrances. Gases are brought from the end ports downward to a common outlet at the middle of the manifold. A 10-lb core forms the external body of the outlet. A choke coil core, weighing 0.75 lb and forming a pad on the No. 4 exhaust port, completes the exhaust manifold coring. All cores are of oil sand mixes.

Intake Manifold—This is an aluminum casting formed in a permanent mold with a 3-lb oil or resin-sand shell core. Weighing about 8 lb, the manifold consists of a plenum chamber from which six long, curved branches supply fuel-air mixture to the individual cylinders. In the assembled engine the plenum chamber is situated

Oil-bonded sand core is set in half of a permanent mold which makes aluminum intake manifold

By R. W. RUDDLE
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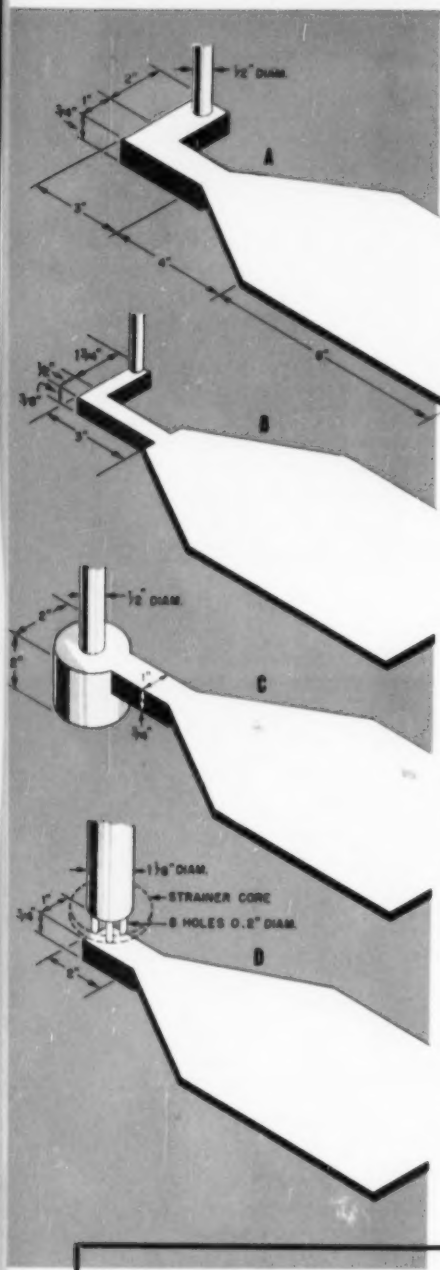
Gating Copper

This article in our gating and risering series summarizes current thinking and results of recent research on the gating of copper alloy castings. The next installment will cover risering of copper alloys



● CURRENT THINKING and the results of recently conducted research on the gating and feeding of copper alloy castings are summarized in this article. Results of this research will be brought together in convenient and readily usable form in the hope that this will prove a convenient guide for the practical foundrymen.

Gating—A gating system should introduce the metal into the mold in such a way that these goals are achieved:

1. Passage of dross or slag from the ladle into the casting is avoided.
2. Production of dross during passage of the metal into the casting is minimized.
3. Entrainment of air or mold gases into the metal stream is minimized.
4. Mold and core erosion are avoided.
5. Metal is introduced into the mold cavity at a rate and at locations such that solidification occurs with minimum shrinkage unsoundness and distortion.

In addition, the method of gating employed always should be such as to maximize casting yield, consistent with fulfilling its other functions. Another criterion of a good gating system is that it should involve the minimum amount of molding time and should be readily removable from the casting.

The importance of correct gating practice hardly can be overemphasized. Harding,[1] for example, has estimated that up to 50 per cent of foundry rejections are the result of poor gating practice. It follows that the use of better techniques should result in considerable savings. Until recently, however, the design of gating systems has de-

Fig. 1—Simple running system used by Glick, Jackson, and Ruddle to cast plates 6 in. wide x 8 in. long x ¼ in. thick in several copper alloys

TABLE I—Performance of Simple Systems of Fig. 1 with Alloys of Groups A and B

		Angled Runner						Wall Base					
		Horizontally Run				Up Run		Parallel Sprue		Tapered Sprue		Strainer Core	
	System	A		B		B		C		C		D	
	Fig. reference	1a		1b		1b		1c		1c		1d	
	Gating ratio	1:4:1.3		1:1:0.7		1:1:0.7		1:4:1.3		1:4:1.3		1:0.25:0.75:0.25	
Group	Assesment of dross formation	V*	R†	V	R	V	R	V	R	V	R	V	R
A	(Phosphor bronze	2	–	2	–	–	–	–	–	–	–	–	–
	(Leaded gunmetal	2	4	2	2	1	1	1	1	–	–	1	1
	(Aluminum bronze	8	9	7	8	–	–	3	6	3	5	7	9
B	(High-tensile (brass	8	10	–	–	–	–	3	8	3	7	–	–
	Wt. of system, lb	1.66		0.87		0.87		2.96		2.96		2.44	

*Visual examination. †Radiographic examination.
Note: No. 1 indicates a very high quality casting, with the quality decreasing as the number increases. No. 10 is shown when a very poor quality casting was obtained.

Alloy Castings

pended to a great extent on the whims and fancies of the individual founder. Little or no attempt has been made to put this subject on a firm footing. In recent years, gating has received long overdue attention from research workers, and the whole subject at last is being placed on a proper foundation.

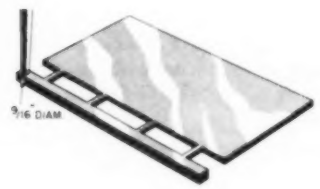


Fig. 2—Multi-gate system with gating ratio 1:1:0.9. Runner bar cross section 9/16 x 7/16 in. Gates ¼ x 7/32 in.

This article is based largely on the results of work of this kind and is intended to illustrate the principles involved rather than to describe in detail large numbers of individual systems which have been applied to particular castings. The reader interested in particular types of gating systems for use with particular castings should turn to publications such as that of Dwyer[2] and others which have summarized these designs.

Effect of the Alloy—The flow of metal from the ladle through a gating system into the mold cavity almost inevitably is accompanied by some turbulence. The extent of the turbulence varies considerably, however, with the design of the gating system. A well designed system with smooth, curved bends and a tapered sprue produces much less turbulence than a crudely designed system with sharp right-angle bends and a sprue with parallel walls. Furthermore, the amount of turbulence governs the extent to which the metal is damaged during flow into the mold. A high degree of turbulence generally produces dross or slag and entrains air or mold gases in the metal stream.

It is important, however, to note that the amount of damage produced by a given gating system also depends on the alloy being cast. Alloys which form a fluid slag as a result of oxidation are affected least; those which form a powdery dross are affected more; and alloys which form tenacious oxide skins are affected greatly by severe turbulence in the gating system.

On this basis it is possible to place the commonly cast copper alloys in the following order: Phosphor bronze, gunmetal, leaded gunmetal (red brass), copper (deoxidized or oxygen-bearing), cupronickel, yellow brass, silicon bronze, aluminum bronze, and high-strength yellow brass or manganese bronze.

The above alloys are listed in increasing order of susceptibility to damage during gating. The first six do not differ greatly in the extent to which they are affected by turbulence in the gating system. All are relatively insensitive, and may be classified as Group A. The last three alloys on the list, however, are easily damaged by turbulence in the gating system and thus differ markedly from the alloys of Group A. It is appropriate to label these latter alloys Group B.

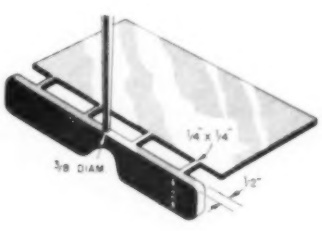


Fig. 3—Large runner system is advocated by Pellini, *et al*

The great extent to which alloys of Groups A and B differ in their susceptibility to turbulence is illustrated by some results recently obtained by Glick, Jackson, and Ruddle.[3] These workers cast plates 6 in. wide x 8 in. long x ¼ in. thick in a number of alloys of both groups, using the gating systems illustrated in Fig. 1. These systems are relatively simple, systems A and B permitting a high degree of turbulence and systems C and D somewhat reduced, although still considerable, amounts of turbulence.

In these experiments the quality of the casting was assessed by visual examination of the surface for the presence of oxide films, flow marks, and dross inclusions and also by radiographic examination for dross inclusions. Several results obtained are summarized in Table I, which shows that although quite satisfactory castings were produced from metals in Group A, castings made in metals of Group B varied from extremely poor to moderately poor. It is particularly interesting that use of a strainer core produced no improvement at all in alloys of Group B. Economically desirable systems for metals of both groups are considered in some detail in the following subsections.

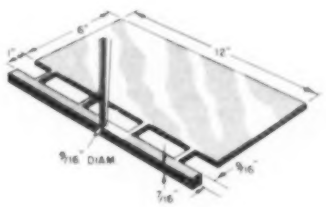


Fig. 4—System found to give a fairly good uniformity of flow by Glick, Jackson, and Ruddle

Group A Alloy Gating Systems

Single Gate Systems—As indicat-

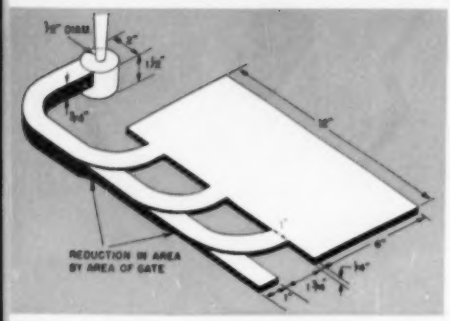


Fig. 5—System designed by Eastwood has 1:4:4 gating ratio

ed in Table I, the work of Glick, *et al*[3] has shown that acceptable castings in alloys of this group can be produced by the use of relatively simple systems of crude design in which little or no precaution is taken to avoid turbulence. Acceptable results can be obtained in red brass with all of the systems illustrated in Fig. 1. Therefore, with these alloys there normally is no point in employing more elaborate systems designed to minimize turbulence since such systems cause higher pattern and molding costs.

An objection to the parallel-walled sprues used in the designs illustrated in Fig. 1 is that the stream of metal contracts away from the mold wall as it gains speed in falling. This action tends to produce a vacuum, thus sucking air into the metal stream. This objectionable feature can be avoided by use of tapered sprues, the taper being adjusted exactly to compensate for the contraction of the metal stream. In general, use of a tapered sprue (big end up) is recommended because of the improvement in yield and the reduction in air or mold gas entrainment. It must be recognized, however, that in some circumstances this feature may render molding a little more difficult.

Parallel-walled sprues are reasonably satisfactory with alloys of Group A, provided that the system is mildly choked—that is, that the total gate area is about equal to or slightly less than the sprue cross-sectional area. In addition, a well base or right angle in the runner is desirable to dissipate part of the momentum of the metal before it enters the mold cavity.

The gating ratio used in these simple systems is of some importance. It is desirable to avoid heavy choking at the gates, since this causes the metal in the mold to be injected into the mold cavity at high velocity and may cause severe erosion of the mold and cores. For this reason a gating ratio of about 1:1:1 generally is ideal, and the gating ratio seldom, if ever, should be less than 1:1:0.8.

Common practice in the casting of many alloys of Group A, especially small castings, is to utilize the gating system to feed the casting. In this event, the sprue and runner gates usually are of massive section, and if satisfactory feeding is to be obtained, the sprue also must be relatively tall. Severe turbulence takes place in gating systems of this kind, but does not appear to be objectionable in the case

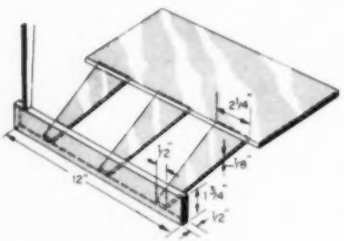


Fig. 6—System by Robertson and Hardy. Gating ratio is 1:14

of most alloys of Group A; however, attempts to use this type of gating system should never be made with alloys of Group B.

Multiple-gate Systems—The same general principles may be used in the design of multiple-gate systems for alloys of Group A; the only additional consideration is the desirability of obtaining substantial uniformity of flow from the several gates. Nonuniformity of flow should be avoided because it produces severe swirling in the mold cavity which causes pools of dross to form and results in a poor surface on the casting. In practice, many multiple-gate systems such as that illustrated in Fig. 2 virtually are useless and might as well be replaced by a single-gate system because one or two of the gates carry the bulk of the flow, the remaining gates passing little or no metal.

In the system illustrated in Fig. 2, most of the metal enters through the gates farthest from the sprue, relatively little passing through the other gates. The intent of the foundrymen thus is vitiated if he employs a gating system of this kind.

Although severe choking equalizes flow rates through the different gates in a multiple-gate system, this method of obtaining uniform flow is undesirable because of mold erosion. Castings of thin section sometimes are exceptions to this rule since high-velocity jets of metal entering the mold cavity sometimes assist in running.

With alloys of Group A, probably the simplest way of producing uniform flow in multiple-gate systems is to employ a gating system involving an enlarged runner as illustrated in Fig. 3. This system has a gating ratio of 1:18.5:2.25, and is based on a design by Johnson, Baker, and Pellini.[4] It is naturally heavy, and although it gives excellent uniform flow, low yield may make it uneconomical.

Reasonably satisfactory results may be obtained, however, with a system such as that illustrated in Fig. 4 which is essentially similar, although the enlargement of the runner is much reduced. This system should have a gating ratio of 1:2:1 or 1:3:1.

Group B Alloy Gating Systems

With Group B alloys, minimization of turbulence in the gating system is vital, as indicated by Table I. It shows that systems acceptable for alloys of Group A yield poor quality castings when used with alloys of Group B. It therefore is particularly important that gating systems used with these alloys incorporate tapered sprues to minimize air aspiration and that precautions be taken to insure that runners and gates are kept full of metal. This latter condition generally can be met by taking the gates off the top of the runners.

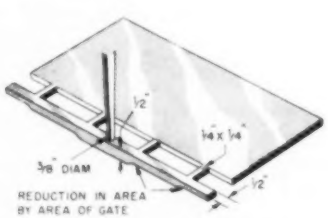


Fig. 7—System devised by Johnson, Baker, and Pellini. The gating ratio is 1:4.5:2.25

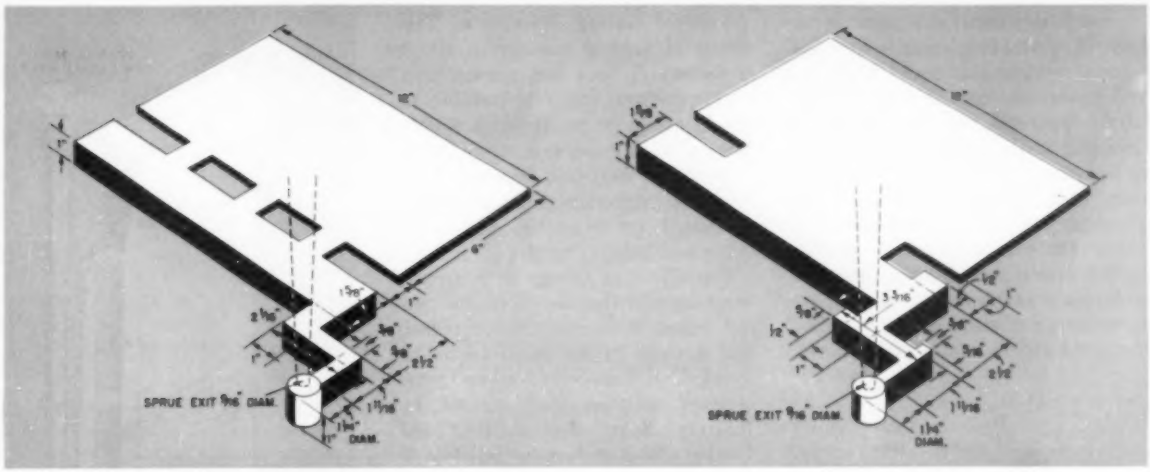


Fig. 8 (left)—System by Neilsen. Gating ratio is 1:(1.4:2.5:4.0:6.5):1. Fig. 9 (right)—Modification of Neilsen's system (Fig. 8) incorporates dross traps

It is equally important that metal enter the mold cavity at a low velocity, and the use of high gating ratios (such as 1:4:4) therefore is recommended, unless other steps are taken to reduce the velocity of the metal. The greatest turbulence generally is found at the base of the sprue, and the use of a well base is advisable to reduce this.

Damage to the metal is greatest in the case of the first metal to pass through the running system, and with alloys of Group B it is desirable to make some provision for diverting this metal into a dead end. Alternatively, some kind of skim gate may be employed, although the effectiveness of these devices is open to some doubt.

The pouring basin, which rarely receives sufficient attention in practice, is an important part of the system. For alloys of Group A, design of the pouring basin is not important, and the usual form of conical enlargement of the sprue at the top is adequate in most instances.

For alloys in Group B, it is desirable that a pouring basin of correct design be used. The pouring basin should be large enough that metal can be poured into it without plunging straight down the sprue. Shape of the basin is not particularly important. To maximize the flow rate, however, it is desirable that the sprue entrance be radiused. With sprues having an entrance diameter of about 1 in., a radius of curvature at the entrance of about 1¼ in. is optimum.

As the result of research by Eastwood[5] on the gating of aluminum alloys, by Robertson and Hardy[6] in connection with aluminum bronze, and by Johnson, Baker, and Pellini[7] in connection with steel castings, excellent designs are available in which turbulence is at a low level. Some particularly satisfactory systems devised by these workers are illustrated in Fig. 5, 6, and 7 (see also Fig. 2 and 4). Glick *et al* recently have verified that all these systems give good results with alloys of Group B. Callis[8] also found good results with aluminum bronze with a modification of the system devised by Robertson and Hardy.[6]

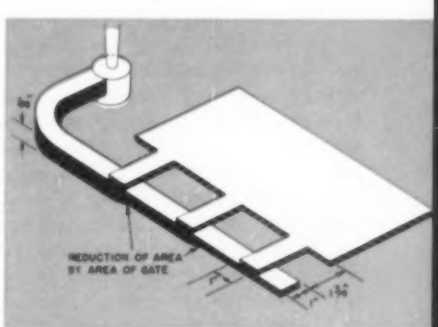
Neilsen[7] has advocated systems in which the metal stream is caused to turn through a series of bends, the runner being enlarged after each bend, as illustrated in Fig. 8. Systems of this kind, although extremely satisfactory with alloys of Group A, tend to introduce dross when used with alloys of Group B. It has been shown[3] that if dead-end dross traps are introduced at each bend, however, as in Fig. 9, fairly satisfactory results can be obtained with alloys of Group B.

The system devised by Eastwood and illustrated in Fig. 5, although technically satisfactory, requires expensive pattern equipment and may be objectionable on this score; it also is not easy to mold. Glick and his co-workers[3] have found, however, that this system can be simplified drastically as illustrated in Fig. 10.

The principal features of this system include a well at the base of the tapered sprue, curved runner bends, reduction in the runner cross section as each gate is passed, and gates taken from the top of the runner, together with a dead end type of dross trap. This system may be recommended to founders as a safe and economical method of gating alloys of Group B.

Glick, Jackson, and Ruddle also have shown that good results may be obtained by combining a multiple slot sprue of the kind used in producing magnesium alloy cast-

Fig. 10—Simplified version of system devised by Eastwood, *et al*, with gating ratio 1:4:4



ings with slot gates as illustrated in Fig. 11. Molding costs with this type of system are high, however, and it scarcely can be recommended for general use with alloys of Group B. The yield with systems embodying slot sprues is high, however, and this point may be an advantage in certain instances.

Systems similar to that devised by Robertson and Hardy[6] also are technically satisfactory. An important feature of these systems is that the gates are up-run and also flared

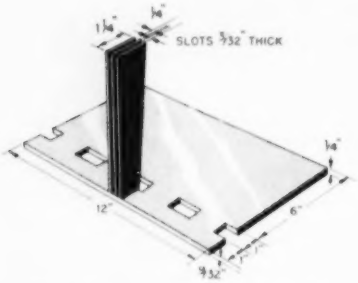


Fig. 11—System embodying slot sprues. Gating ratio 1:2:2

out, with the result that momentum of the metal is reduced greatly as it enters the mold cavity (Fig. 6). Molding difficulties may render this system uneconomic in many instances since the use of an odd-side or a core for the gates is necessary.

An important observation made by Glick, Jackson, and Ruddle[3] is that the performance of gating systems which normally give indifferent results with alloys of Group B often can be improved considerably by tilting the mold to an angle of about 15 degrees, thus up-running the metal into the casting. This procedure enables reasonably satisfactory results to be obtained from systems, such as that illustrated in Fig. 2, which otherwise would give poor quality castings in this group of alloys. The use of up-running can be recommended as a simple way of obtaining adequate results from easy-to-mold gating systems which normally would be inadequate for these alloys. It also may be noted that if up-running is practiced with systems of the Robertson and Hardy type, Fig. 6, it should be possible to replace the sloping gates with horizontal gates, thus substantially reducing molding cost.

Vertical Gating Systems — The gating of vertical castings in alloys of Group A does not present any great problem, for it is possible to obtain adequate results with simple bottom gating arrangements. Alternatively, with tall, hollow, cylindrical castings such as liners, a ring of pencil gates at the top often gives satisfactory results.

For alloys of Group B, however, great care in the design of the gating system is necessary if turbulence and damage to the metal are to be avoided. Relatively complicated systems such as that devised by Johnson, Baker, and Pellini,[4] and Grube and Kura[5] must be used if high quality is to be obtained. The system devised by Johnson *et al* is illustrated in Fig. 12 and has been designed so that the gates feed in sequential order, beginning with the lowest gate and finishing with the highest gate. The hottest metal thus is introduced just below the feeder, and temperature gradients which are ideal from the point of feeding are set up in the casting during pouring. The dimensions of this system are critical and Glick *et al* found that a gating ratio of 1:4:1 is ideal.

The system of Grube and Kura is illustrated in Fig. 13. This system employs a bottom runner with a dross trap which up-runs the metal into a vertical riser which is itself connected to the casting by a web-gate. The principle involved here is that the velocity of the metal largely is absorbed by the time the metal passes through the web so that it flows quietly into the casting. Sequential flow is obtained because the momentum of metal passing out of the horizontal runner at the bottom of the casting causes it to flow up the riser before passing without vertical momentum through the web-gate to the casting.

Glick *et al* found that with alloys of Group B, the thickness of the web is critical, and they concluded that a thickness of about ⅜ in. is ideal. Thinner webs than this give rise to cascading of the metal through the web and to consequent severe dross formation. On the other hand, thicker webs result in the metal's running straight into the bottom of the casting and setting up temperature gradients which are not ideal from the point

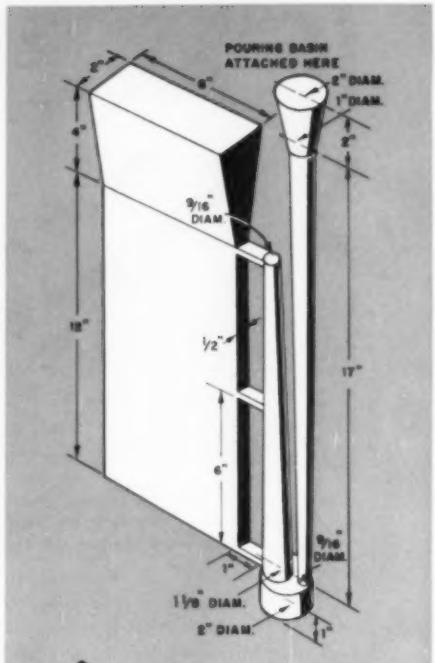
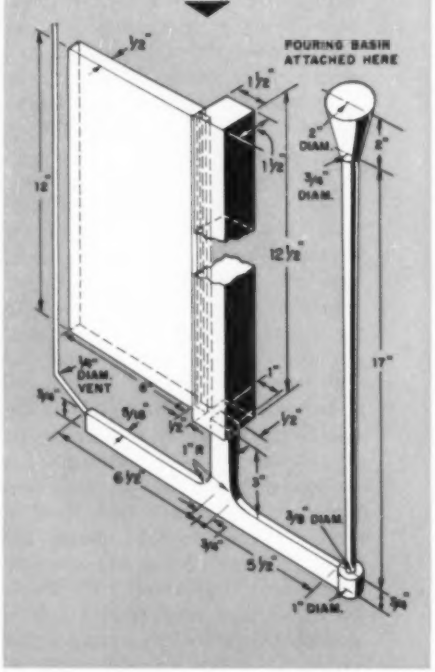


Fig. 12—Vertical gating system devised by Johnson, Baker, and Pellini. Gating ratio 1:4:1

Fig. 13—Vertical gating system devised by Grube and Kura with gating ratio of 1:2:4



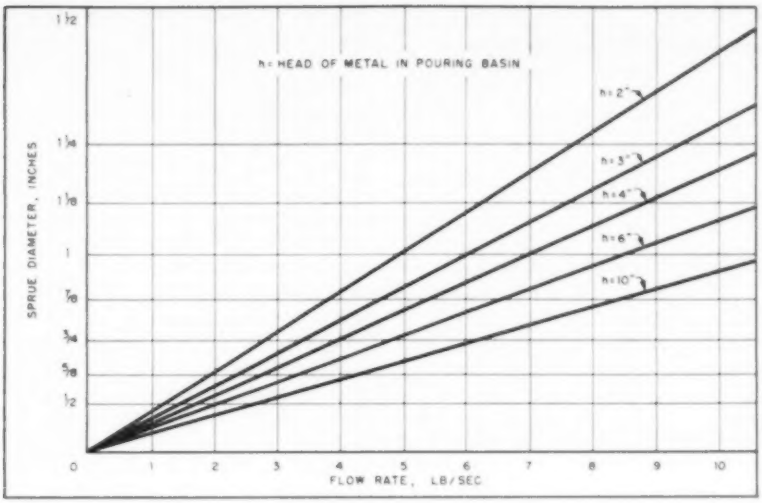


Fig. 14—Flow rates of copper alloys delivered by unchoked system with parallel-walled sprues of various diameters and various effective heads

of view of feeding the casting.

Sprue Size and Flow Rate

Unchoked Systems—In unchoked systems (those in which the gating ratio is greater than 1:1) the rate of metal flow is governed mainly by the sprue diameter and the effective head. In the case of unchoked systems with parallel-walled sprues, the effective head is equal substantially to the head of metal in the pouring basin. This head and the diameter of the sprue control the rate of flow. The flow rates delivered by unchoked parallel-walled sprues of various diameters under various effective heads are shown in Fig. 14.

As indicated earlier, tapered sprues generally are preferred because they introduce little or no gas into the metal stream. Furthermore, casting yield is improved because a tapered sprue designed to deliver metal at a particular rate has a smaller volume than the equivalent parallel-walled sprue.

With the tapered sprue, the effective head is always the sum of the sprue height and the head in the pouring basin, and the controlling dimension is the sprue exit diameter. The way in which the flow rate in substantially unchoked big-end-up tapered sprue systems is dependent on the sprue exit diameter is indicated in Fig. 15. With the tapered sprue the entrance diameter depends both on the exit diameter and on the height of the sprue; values for the sprue entrance diameter may be taken from Fig. 16. These two figures provide data useful in the design of gating systems.

In the case of bottom gating systems, especially those employing a tapered sprue, the effective metal head, for obvious reasons, steadily decreases throughout pouring. The flow rate therefore decreases correspondingly, and larger sprues than indicated by Fig. 15 will be required to fill a casting in a given time. Fig. 17 gives a factor by which the required flow rate must be multiplied before entering in Fig. 15 to obtain the right sized sprue. This correction factor applies accurately only to castings of uniform cross section, but it is easy to make a rough allowance for castings of nonuniform cross section and thus obtain an answer which is satisfactory for practical purposes.

Choked Systems—In the case of choked systems utilizing tapered sprues, frictional effects in the runner and gates will reduce the flow rate with a given sprue exit diameter to values below those indicated by Fig. 15. If the choke is relatively mild, the flow rate is generally reduced by 10 to 20 per cent. This order of reduction is found when the total gate area is about equal to the sprue exit area. Heavier chokes have a considerably larger effect and in extreme cases may reduce the flow rate by 50 to 60 per cent of values shown in Fig. 15.

Gating System Design

The first step in the design of a gating system is to select a geometry which will suit the alloy being cast and the geometry of the casting, in line with the considera-

Fig. 15—Sprue exit diameter versus flow rate for sprues and pouring basins of various heights for copper alloy castings which were poured in big-end-up tapered sprue systems

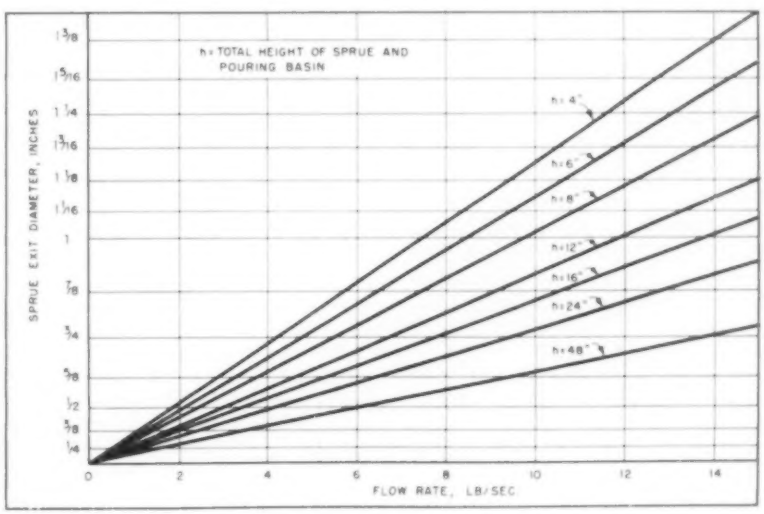


TABLE II—Summary of Recommendations of Glick, Jackson and Ruddle [3]

System	Fig. No.	Principal Features	Gating Ratio	Weight, lb	Uniformity Of Flow
		ALLOYS OF GROUP A			
Simple Gate Systems:					
Rt. angle runner	1b	Best results when up run. Tapered sprue best but parallel sprue acceptable	1:1:0.7	0.87	....
Well-base	1c		1:4:1.3	2.96	....
Multiple Gate Systems:					
Single systems	4	Tapered sprue at center of runner; gates from top side of runner.	1:2:1	1.74	Fair
	..	Similar with gates from top face of runner	1:2:2	1.74	Good
		ALLOYS OF GROUP B			
Slot sprue system	11	Tapered slot sprues; slot gates off top side of runner	1:2:2	2.28	Good
Modified Eastwood	10	Tapered sprue; well base; large runner, stepped at gates. Large gates off top of runner	1:4:4 or 1:6:6	5.46 (1:4:4 version)	Good
Modified Robertson and Hardy	6	Tapered sprue into large runner sump. Flared gates angled from bottom of runner and choked at runner end	1:4:4	4.92	Good

tions discussed above. For convenience in this regard, the recommendations of Glick *et al* are summarized in Table II. The second step is selection of the gating ratio. In many cases this will be determined by the type of system used, as for example, with the system of Fig. 5 and 10, where the gating ratio is normally 1:4:4 or 1:6:6. If, for example, the system of Fig. 10 is to be employed, the gating ratio probably will be about 1:4:4. The runner area will therefore be four times the sprue exit area, so that the runner diameter is obtained by multiplying the sprue exit diameter by the square root of 4. The total gate area is obtained in the same way; it is four times the sprue exit area.

The next step is selection of the pouring rate. If the casting is poured from a hand ladle, this rarely will be more than 4 lb per second, since this is about the limiting rate at which a single operator can pour from a hand ladle. Higher rates of pouring are possible with multiple sprues poured by more than one operator, or where a larger ladle is used.

Assume that in the given case, the desired flow rate is 4 lb per second and that the sprue height is fixed at 6 in. by the molding boss and the pouring basin used. In this event, Fig. 15 shows that the required sprue exit diameter is 11/16 in. Reference to Fig. 16 indicates the entrance diameter to be a little in excess of $\frac{3}{4}$ in. In practice some margin of safety is allowed and in the present instance the sprue entrance diameter normally would be fixed at about $\frac{7}{8}$ in.

Next month, the concluding installment of this article will take up risering of copper alloy castings.

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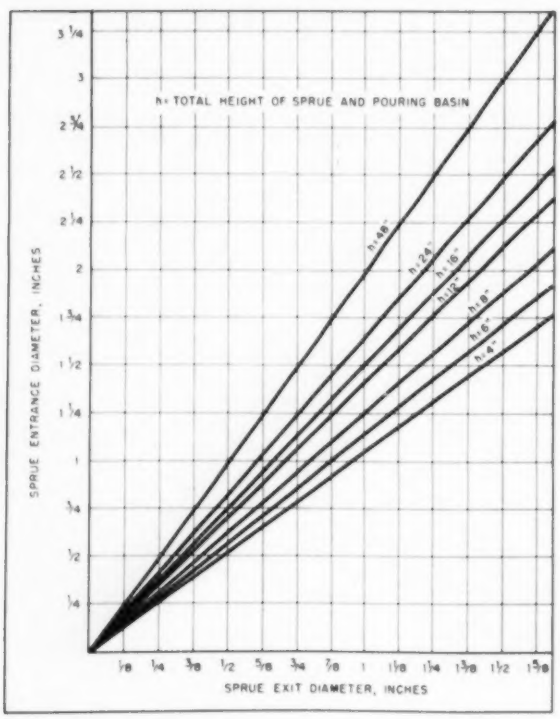
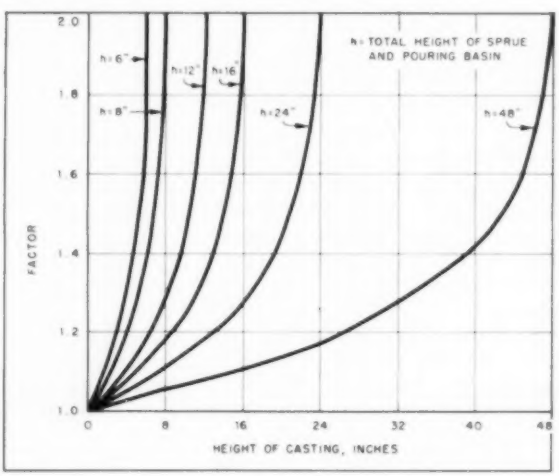


Fig. 16—Entrance diameter of tapered sprue versus exit diameter for sprues and pouring basins which were of various heights

Fig. 17—Delivery factor for bottom-run castings which were of various heights



A New Test for Fluidity

New type of test is developed to deal more specifically with the ability of metal to fill a mold. As an additional test, this type can be applied in the foundry as well as in the laboratory

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● FLUIDITY is a term so familiar to the foundryman that its definition hardly needs repeating, yet a literature survey indicates that the definition has by no means been agreed on by foundrymen.

The definition quoted most generally is that "fluidity is the ability of a metal to flow and to fill a mold." This definition implies the combined properties of the metal and the mold; consequently, a fluidity test should be developed on the same basis. Many references in the literature can be found, however, in which only metal flow has been taken as the basis for both the definition and testing of fluidity.[1]

It is not surprising that, on the whole, metallurgists have tended to emphasize the flow behavior and that foundrymen consider metal flow and mold filling as combined effects. This divergence of view is unfortunate and is the most likely reason for the current stalemate in developments in this field. A suggestion for classifying fluidity terminology and the relevant issues will be presented at the end of this paper, but for the present the foundrymen's definition of fluidity will be taken throughout, and will be referred to as the casting fluidity.

History of Testing — Because of the initial lack of agreement on fluidity terminology, a number of differences developed in ideas for testing. Tests used to fall into two categories, either involving the flow only, but not the solidification, or involving both phenomena. In the former categories are the outflow tests of Ruff,[2] Sanders and Kain,[3] and Scheil.[4] These workers were concerned mainly with the problems associated with the hydrodynamics of molten metal flow in a channel.

The investigators who used tests in which the metal flows, but cools so rapidly that it solidifies in the test mold, are by far the most numerous. Work of this type has been reviewed by Krynitsky[5] and by Hutter.[6] The most representative type of test in this group is the spiral test, of which the following features can be summarized briefly from the published literature:

1. *Design*—Green or core sand, shell or CO_2, or metal molds have all been used. The cross section of the channel varies from round to oval and strip type and the area from 10 to 100 sq mm. Numerous pouring basin designs are used since the rate of filling the mold has been found to be one of the most important variables affecting reproducibility of results.

2. *Characteristics*—The length to which a molten metal runs in the test mold channel when it is cooled at the same time has been found to be affected by the heat transfer phenomena (metal and mold properties), solidification character of the metal, and hydrodynamic variables (metal and mold factors).

3. *Applications* — The spiral test has been used largely in the past for metallurgical investigations—namely, as a test for studying the effects of various variables considered to have an effect on fluidity. Only a few examples are found in the technical literature in which the spiral test has been used on the foundry floor to deal with some specific foundry problems. The studies of Yao[7] and Evans[8] are examples of this type of spiral test application.

This brief historical survey of fluidity testing demonstrates that most investigators concerned themselves directly with the problems of metal flow and only indirectly with the problem of "ability of a metal to fill a mold." But the assumption made by many investigators that the same variables that affect the ability of metal to flow will control at the same time and to the same extent the ability of metal to fill the mold, may be quite erroneous. The work of Wood and Gregg[9] for example, reveals this point clearly. They have shown that for a number of nickel-base alloys the ability of a metal to fill a mold could not be related to the fluidity spiral length.

The spiral test has been found to be related more directly to the ability of molten metals to flow than to their mold-filling ability. Another serious practical limitation is that it requires a laboratory measure of control to obtain reproducible

results and cannot be used readily on the foundry floor. Consequently, these two major problems must be considered in the question of fluidity:

1. Whether a new type of test should be developed to deal more specifically with the ability of metal to fill a mold. 2. Whether such a test could be applied on the foundry floor as well as for laboratory and research work. This paper will deal with these two questions.

Mold-Filling Ability—Molds involving thin sections or fine details frequently do not fill fully. This problem normally is dealt with by changing one or more factors, the most important of which is pouring temperature. In theory, a casting

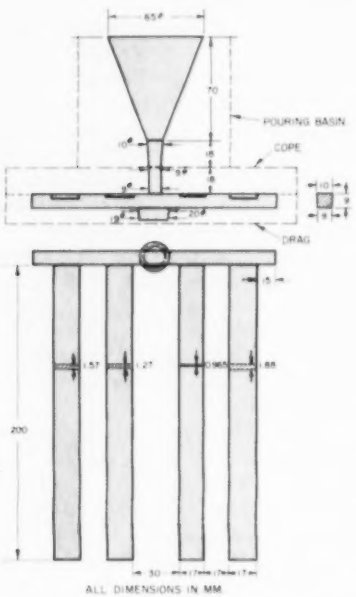

Fig. 1—Design of the proposed test mold used for most of the work reported in this paper

of however complex design and in any alloy could be cast by adequate temperature control of the metal and the mold. However, this solution of the problem is not practical in most cases, and only special or highly fluid alloys have to be used for difficult castings.

It follows that a mold-filling ability test should include a test piece based on thin sections. Various designs of fine detail also could be incorporated on surfaces of thin sections of the test piece. Such a test could have two objectives—use as a metallurgical tool to study mold-filling ability or use on the foundry floor as a production control test, or for both purposes.

TABLE I—Effect of Gating Ratio on Casting Fluidity

Pouring Temperature	Gating Ratio	Strip Lengths in Cm			
		Strip 0.965	Strip 1.37	Strip 1.57	Strip 1.98
720° C	1:2:1	2.0	5.5	8.0	12.9
	2:1:1	4.0	8.0	9.8	15.0
700° C	1:2:1	1.8	4.6	7.6	11.5
	2:1:1	3.3	6.8	9.0	11.8

With these objectives in mind, a number of test designs were experimented with, leading eventually to the test shown in Fig. 1. A typical test piece produced is shown in Fig. 2. This design was used for most of the work reported in this paper. The test consists simply of a number of strips of various thickness that are run off the common runner bar. The total length of all the strips obtained can be used as a measure of the mold-filling ability of a metal or, alternatively, the length of each separate strip can be studied.

The gating system of a typical mold involves pouring basin, down runner, well, runner bar, and ingates. In principle, a test of mold-filling ability should incorporate the same elements. Properties of the metal and mold as well as foundry variables play an important part in producing a complex casting. Consequently one of the first questions to be investigated with the proposed test is its sensitivity to those properties encountered in founding.

General Characteristics — Any new mold-filling ability test should be simple to execute and have a high degree of reproducibility. Fig. 1 shows that the first of these conditions is reasonably well met from the point of view of patternmaking and molding. All molds used for the work described were made by the CO_2 process, but other molding methods can be used.

The principal error in molding is the variation in strip thickness. With normal foundry methods, the reproducibility of the trial length of all strips obtained is of the order of ±2.5 per cent. This variation is equivalent to 10° C change in pouring temperature. To maintain good reproducibility it is necessary to fill the pouring basin quickly and not to vary the height of pouring more than 1 to 1.5 cm.

Effect of Metal Properties—The effect of the pouring temperature obtained with 4 per cent Cu-4 per cent Si aluminum alloy is shown in Fig. 3. As expected, the proposed test is sensitive to pouring temperature. In fact, the test could be used readily to measure metal temperature for many foundry applications.

Metal composition also affects mold-filling ability. For example, phosphorus raises the mold-filling ability of cast irons. Fig. 4 shows the effect of pouring temperature on the mold-filling ability of two irons which differ only in their phosphorus contents. It appears that with an addition of 0.5 per cent P to the iron used, a pouring temperature can be reduced 50° C to obtain the same degree of mold-filling ability.

According to Evans,[10] however, an addition of 0.5 per cent P to a similar iron lowers the beginning of solidification of the alloy to the extent of 40° C. Consequently, the effect of phosphorus in cast iron on mold-filling ability could be due to two factors: 1. A lower solidification temperature. 2. An alloying contribution of phosphorus as such in increasing the mold-filling ability. It is difficult as yet to separate these two effects quantitatively, but the practical importance of the above results is clear.

Mold Properties — Choice of a molding material seldom is based on mold-filling ability, but it is known that by application of mold dressings, for example, the metal flow and filling of a mold can be altered appreciably. The new test showed, for example, that a fine molding sand gives a greater mold-filling ability than a coarse sand. Similarly an application of a non-volatile carbonaceous mold coating

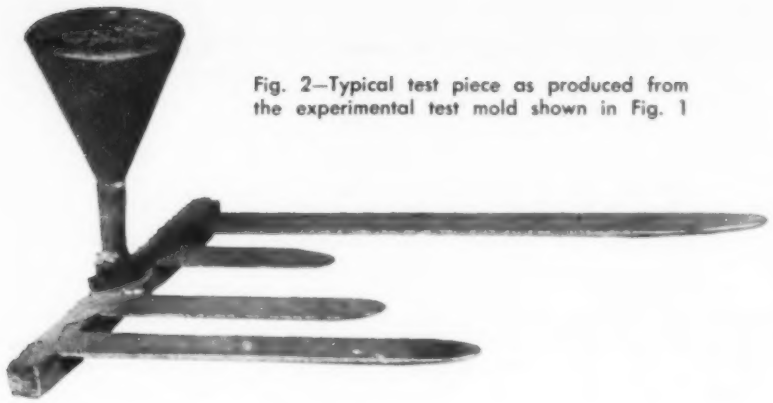

Fig. 2—Typical test piece as produced from the experimental test mold shown in Fig. 1

increases the mold-filling ability.

Casting Variables—One role of the gating system is to control pressure of the metal during mold filling. This aspect of mold-filling ability has been studied by Yao.[11] On general grounds, one would expect that a pressurized gating system would give greater mold filling than an unpressurized system. The new test showed this clearly as seen in Table I.

As shown in this table, with a gating ratio 1:2:1 the length of strips obtained was shorter than with a gating ratio 2:1:1. The alloy used in this case was 4 per cent Cu, 4 per cent Si aluminum. Other features of the gating system which may affect mold-filling ability are the method of filling the pouring basin, pouring height, application of a pouring well, and the relative position of the test strips to the runner bar.

Metallurgical and Hydrodynamic Problems — The most important single reason that a mold does not fill fully under certain conditions is that the metal is being cooled during the flow. It is doubtful, however, that this thermal reason alone, important though it is, would have created the general problem of fluidity as it is known in foundries.

The second reason involves the properties and condition of the metal. Among these properties, the most important are viscosity, surface tension, and mode of solidification. The condition of the metal includes such factors as dross content, slag, entrapped air, and turbulence during the flow. Another group of important factors are of the hydrodynamic character, the speed of mold filling, and the pressure of the metal and its fluctuations. The final factors are mold properties. This field is being investigated.

Some research workers have attempted to treat the problem of cooling of metal during mold filling theoretically, particularly with the spiral test. Such a treatment of the problem probably is only of academic interest. The laws of heat transfer in a heterogeneous material like foundry sand, and in shaped castings of complicated design, are so complex that their practical application is as yet very limited. On the other hand, results obtained by the proposed test offer some interesting observations in terms of heat transfer.

For example, Fig. 3 and 4 show that thin strips are comparatively insensitive to pouring temperature. Secondly, for casting fluidity of the same order, cast iron and copper-base alloys studied require a much higher relative superheating temperature than the light alloys.

The relationship of data so far obtained to the inherent properties of molten metals is difficult to treat in any but a qualitative manner. Data on viscosity and surface tension of molten alloys are very scarce to be applied directly to the mold-filling problem. Many investigators have shown, however, that viscosity of certain metals increases by alloying, a fact which bears close comparison with a corresponding decrease in mold-filling ability.

Similarly Yao[12] maintains that viscosity increases sharply as freezing temperature is approached. An increase in viscosity retards flow speed and hence mold-filling ability. Clearly the importance of viscosity increases with length of the test piece, thus the spiral test is more likely to be sensitive to the viscosity changes than the proposed new test. In general, viscosity is more likely to be an important property during the flow, in the mold filling, when apparent surface tension is of greater importance.

In relation to the apparent surface tension, molten alloys can be divided into three groups: 1. Those covered with a continuous oxide film throughout the casting temperature range (like most of light alloys). 2. Those which form an oxide film only at a certain temperature during cooling (like cast iron and tin bronzes). 3. Those which retain a surface almost free of oxide film throughout the casting temperature range (like phosphor bronze). Each of these typical types shows corresponding change in mold-filling ability as revealed by the new test.

In light alloys, for example, the test shows (Table II) that modified Silumin (13 per cent silicon aluminum alloy) has lower mold-filling ability than unmodified Silumin. Surface tension changes produced by the addition of sodium probably are responsible, but there is some evidence of similar viscosity effects. With copper-base alloys of the bronze group, a rapid increase in mold-filling ability was obtained

TABLE II—Effect of Modification of Silumin on Casting Fluidity

Pouring Temperature	Alloy	Strip Lengths in Cm			
		Strip 0.965	Strip 1.57	Strip 1.57	Strip 1.88
700° C	Unmodified	5.7	8.1	12.8	16.4
	Modified	5.5	6.8	11.3	12.7

with the new test at temperatures in which all oxygen dissolves in the molten metal or when the alloy was deoxidized with enough phosphorus to remove the oxide film (Table III).

In addition to these inherent properties of molten metals, cleanliness of metal entering the mold profoundly affects mold filling. Slag and dross floating on the metal may affect mold-filling ability more than inherent metal properties.

The question of dissolved impurities in molten metals concerns what foundrymen normally call metal condition or the melt quality. Impurities may change inherent properties as well as sensitivity to drossing. This problem is discussed further in the next section, foundry applications.

Hydrodynamic aspects of mold filling also are understood only qualitatively. Most molds apparently are filled by turbulent metal in the gating system. When a mold is filled, the energy of position (pouring basin) is converted into kinetic energy and energy of pressure (running system). Quantitative handling of such a hydraulic problem is difficult because most molds are filled quickly. A stationary state seldom is reached.

In spite of such difficulties, certain general—although only qualitative—conclusions can be obtained from available data. For example, keeping the running system full by reducing the flow area of the stream uses the kinetic energy available at the mold entry to increase the extent of mold filling, as shown in Table I. The proposed new test for measuring mold-filling ability could be used to study the hydrodynamic aspects of mold filling.

TABLE III—Effect of Phosphorus on Casting Fluidity of Tin-Lead-Zinc Bronze

Alloy	Pouring Temp.	Phosphorus Content	Strip Lengths in Cm — Strip 0.965	Strip 1.27	Strip 1.57	Strip 1.88
Bronze 85/5/5/5	1200° C	0.02	3.5	4.0	5.4	8.5
		0.35	6.2	8.0	9.5	15.6
	1150° C	0.02	3.0	3.5	3.8	4.8
		0.35	4.3	6.2	7.5	12.7
	1100° C	0.02	0.8	1.0	1.0	2.2
		0.35	3.5	5.5	6.7	11.8

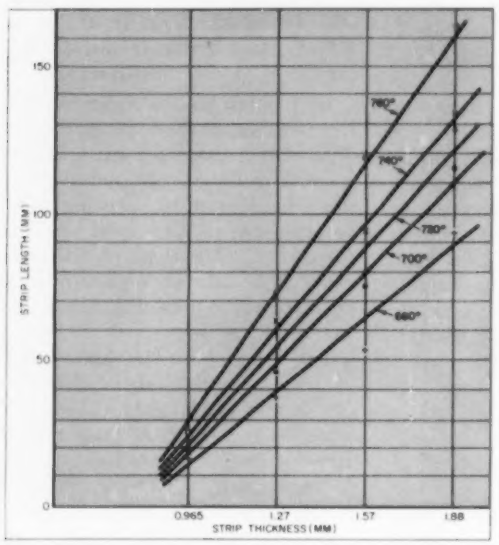

Fig. 3 — Effect of the pouring temperature on the casting fluidity of 4 per cent Cu-4 per cent Si aluminum alloy

Foundry Applications of Test— Good metal quality and correct pouring temperature are essential in casting production. True metal quality is based on absence of undesirable impurities as well as on correct chemical composition. With satisfactory metal quality and temperature, the mold itself is the only remaining factor in the problem of mold filling. Hence, from the point of view of direct applications of fluidity testing on the foundry floor, any proposed test could be applied either for the measurement of temperature or assessment of metal quality. Let us consider these factors in relation to various casting alloys.

Light Alloys — The temperature measurement of light alloys with a thermocouple provides no difficulties, and no alternative method is required. Metal quality of light alloys is affected by the hydrogen content, to which no known fluidity test is sensitive, as well as by other things. Another reason for poor metal quality in light alloys is suspended inclusions, but this difficulty can be avoided by careful fluxing. In general, therefore, no fluidity test can be suggested at this time for direct use on the foundry floor with light alloys. Metallurgical applications of the test, on the other hand, will be discussed in subsequent paragraphs.

Copper and Nickel-Base Alloys— Temperature measurement of copper and nickel-base alloys is essentially an economic problem because of the costs of noble metals and protective silica tubes required. It therefore is possible that a simple and inexpensive type of test, such as that suggested in this paper, could be applied for temperature measurement or rapid checking of these alloys. With the proposed test, it is simple to obtain temperature to $\pm 10^{\circ}$ C, a range satisfactory for most sand foundry requirements.

Obviously, a test of this type can be used for metal temperature measurements only if metal quality is not a variable. Every type of fluidity test is subject to two main variables at the same time, and one of these must be fixed so that the other can be measured. In general, the fluidity test could be used as a checkup or warning test. If the test result is off standard, a further checkup of temperature can be made with more specialized instruments to establish whether the tem-

perature is at the proper level.

Oxygen content is the most common hazard to metal quality of copper and nickel-base alloys. Some of the results reported in Table III show that the proposed test could be used satisfactorily in this area.

Cast Irons—With cast iron, the problem of temperature is analogous to the same problem with copper alloys. Many cast irons can be poured on the hot side without much damage, however, and gray iron founders therefore are more anxious to avoid cold than hot metal. Correspondingly, a pyrometer seldom is seen in a gray iron foundry.

Some form of fluidity test could be used in gray iron foundries with the following objectives: 1. A rapid check of temperature (cupolas, receivers, ladles). 2. As a control test of basic composition (carbon equivalent). 3. As a check test of iron quality.

The last of these still is controversial. According to some foundrymen, cast iron may on occasions lack in fluidity; such a melt is described as "oxidized iron." This condition of the metal is disputed by many other foundrymen, and the problem awaits clarification.

Steel—Literature on fluidity deals preponderantly with the fluidity of steels. A real demand for some form of fluidity test for steel therefore seems desirable.

The proposed new test could be used readily to ascertain the temperature of molten steel. Such an application can be made for all instances in which basic composition or quality control changes do not arise. In a large number of steel melting processes, however, this application is really important, and the proposed test could be applied. The casting fluidity test must be supported by normal pyrometric temperature control.

In conclusion, therefore, it could be said that some form of casting fluidity test can be applied in foundries as an additional test—but not to the complete exclusion of other tests involving temperature or chemical control.

Metallurgical Applications — In comparison with the conventional spiral test, the proposed new test has two distinct advantages: 1. It is of much simpler design and gives more reproducible results. 2. It could be applied to study of the mold-filling ability problem (variables of the mold in particular), for which the spiral test is not readily applicable.

Two metallurgical applications of a casting fluidity test appear justified. First, it could be used for a relative assessment of casting fluidity to provide an index of casting alloys. At present there is no accepted quantitative standard of casting fluidity. Second, a casting fluidity test could be applied to investigations of new casting alloys as well as to investigation of methods of improving casting fluidity of old alloys. Finally, mold properties could be examined in relation to fluidity problems.

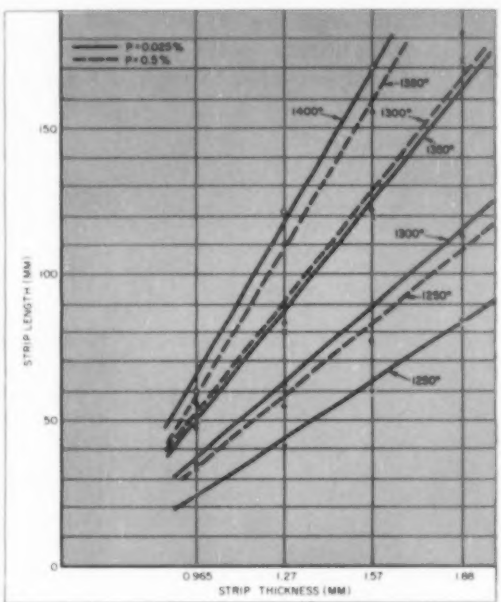

Fig. 4 — The effect of phosphorus content and pouring temperature on casting fluidity of 3.63 per cent C and 1.74 per cent Si gray iron

Classification and Terminology —From the accepted general definition of fluidity and from a study of the past research as well as empirical data available on metal casting, both the flow of liquid metals and the question of mold filling enter into the general problem defined as "fluidity." Consequently, it appears that the term fluidity should be broadened from the point of view of both terminology and testing. A tentative scheme is proposed here as follows:

Fluidity is a general term to describe the ability of metal both to flow and to fill the mold.

Flowing power is the ability of metal to flow, and the test most frequently used is the spiral test.

Casting fluidity is the ability of a metal to fill a given type of mold. A tentative test for this purpose is described in this paper.

Acknowledgments — The author wishes to acknowledge his indebtedness to R. Jones for his continuous help in the work described and to many colleagues in the foundry industry for helpful discussion and practical field tests.

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INVESTMENT SHELL PROCESS

Offers Production Advantages

Although the ceramic shell investment casting process offers certain advantages in the production of close-tolerance, intricate castings, it is not expected to replace flask mold techniques

By ROBERT H. HERRMANN
Associate Editor

● INVESTMENT SHELL casting, an adaptation of the older casting process utilizing flasks to contain the mold material, is growing in use among the industry's investment casting foundries.

Precision Metalsmiths Inc., Cleveland, is one of those who have found the newer process offers certain advantages in the production of close-tolerance, intricate castings. However, Robert R. Miller, company president, is quick to say that the process by no means solves all problems of the investment caster. Flasked molds continue to offer the best technique for producing many types of parts.

Precision Metalsmiths' experience indicates that dimensional tolerances on castings produced by the two processes are about the same. Certain castings with complicated coring, however, can be made better in investment shell molds because the low expansion refractory mold material used reduces the possibility of core shifting.

As-cast surface finish for ferrous and nonferrous castings ranges between 50 and 125 microinches rms, depending on the alloy and configuration of the casting. Parts can be made from almost any castable alloy.

Process Offers Flexibility — The investment shell process offers more leeway on mold size for gating and treeing castings. More patterns can be mounted and different treeing arrangements used because the setup is not confined by a standard flask size. Production of castings is speeded because only 15 hr are involved from the time production of molds starts until they are poured. Molds can be stored indefinitely after patterns are melted out to permit batch pouring and subsequent handling. Investment shell molds are light and easy to handle, require comparatively little mold material and no flasks.

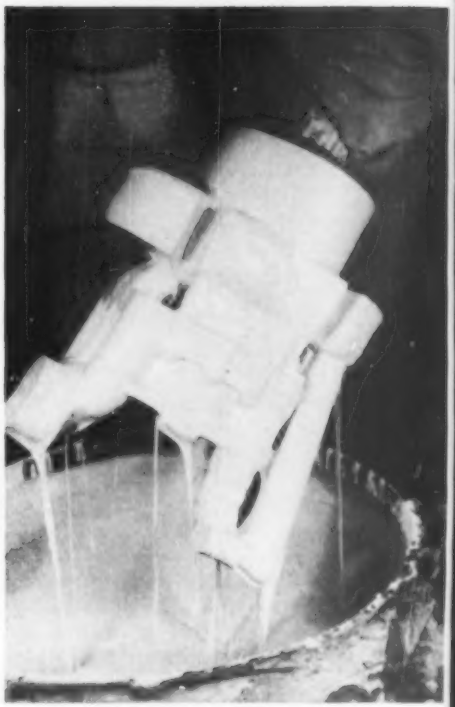
Precision Metalsmiths produces investment shell castings for the automotive, electronic, machine tool, aircraft, missile, atomic energy, camera, instrument, marine, oil well equipment, tire-making, and various machinery industries. Castings range in weight from $\frac{1}{4}$ oz to nearly 100 lb and up to 20 in. on the longest dimension. The foundry has poured 130 lb of steel into unsupported investment shell molds.

Casting sections such as fins 0.030 in. thick, 0.500 in. wide and of any practical length are cast routinely with fluid metals such as the 300 series stainless steels. Rectangular holes measuring $\frac{1}{8}$ x $\frac{3}{8}$ x $1\frac{1}{2}$ in. long as well as Class 1 male and female threads, usable as-cast, also are castable.

Patternmaking — Because of the lesser thermal expansion of investment shell molds, patterns must be slightly larger than those used in making flasked molds. This factor is considered, of course, when dies for patterns and cores are being made for the investment shell process. However, patterns and cores made from dies designed for the flasked mold process may be used when dimensional tolerances of the casting are such that the smaller casting produced in the investment shell is acceptable.

Wax fortified with 5 to 10 per cent polyethylene is used for investment shell process patterns. It is injected into steel dies at about 140° F and between 200 and 300 psi, depending on die cavity volume and intricacy. Individual patterns are gated to a central wax sprue with a small electric iron. In some instances the gates must be larger

Worker uses small electric iron to weld heat-disposable patterns to feeders which, in turn, are welded to a wax sprue



Handles are attached to base of wax sprue and pattern cluster is dipped in a mold slurry

than those used in flask work. Runners, too, often must be larger so they will feed the mold cavity adequately. There is considerably more heat loss through the walls of the shell than through the bulk of investment in a flasked mold. Although compensation must be made for the heat loss in this instance, the chilling action can be used to advantage in other cases.

After the patterns, gates and runners have been assembled to the sprue, a wooden handle is attached to the base of the sprue to facilitate hand-dipping in the mold slurry and application of granular refractory (stuccoing) during mold-making. The handle has a bolt mounted into one end which is screwed into a metal nut embedded in the base of the wax sprue.

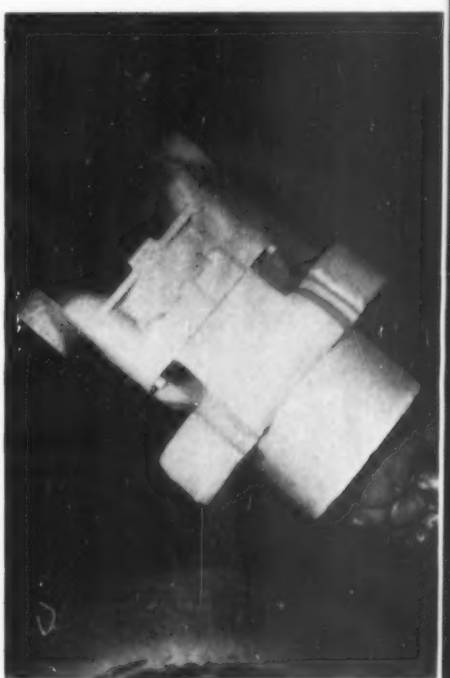
Molding—Molds are produced in a room in which temperature is held between 72 and 78° F and below 60 per cent relative humidity. A constant temperature prevents expansion and contraction of the wax patterns with resultant cracking of the molds. The low humidity provides optimum conditions for drying the mold slurry coatings.

Trees of patterns first are dipped in a prime slurry material consisting of water-base silica sol binders, and fused silica flour refractories. Both are minus 325 mesh. Viscosity of the slurry is about 1500 centipoise (cps).

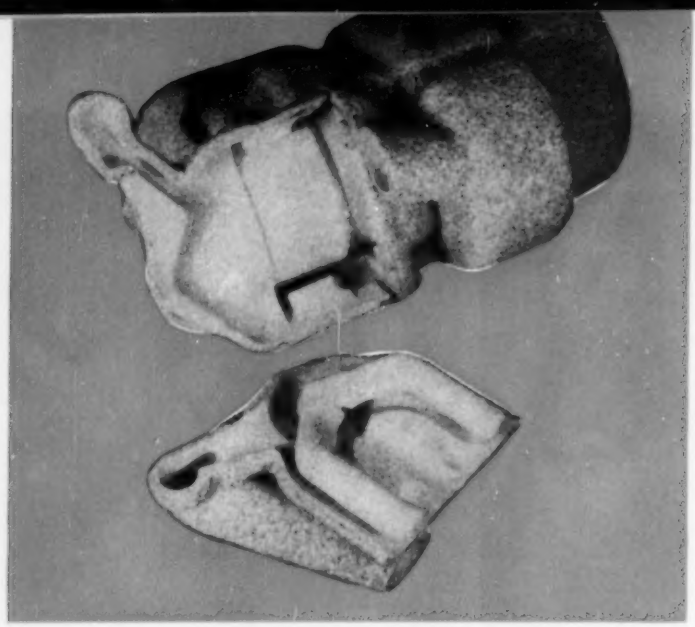
Surplus slurry is shaken off the tree to avoid runs. Then the trees are held under a vibrating screen in a cabinet for stuccoing with needle-shaped fused silica grains measuring 0.010 to 0.020 in. on the major axis. Extra stuccoing material is poured into cored openings to assure complete coverage of the dip coat. Excess refractory material is removed by twisting and turning the pattern tree. Stuccoed molds are hung on racks in a stream of air supplied by fans. Drying takes 45 minutes to an hour.

The second dip-coat slurry is of the same material as the first, but at a lower viscosity. The thinner slurry is used to assure that the entire pattern tree is wetted because the first coat acts as a blotter. Here again fused silica is used for stuccoing. This coat is dried for the same length of time as the first.

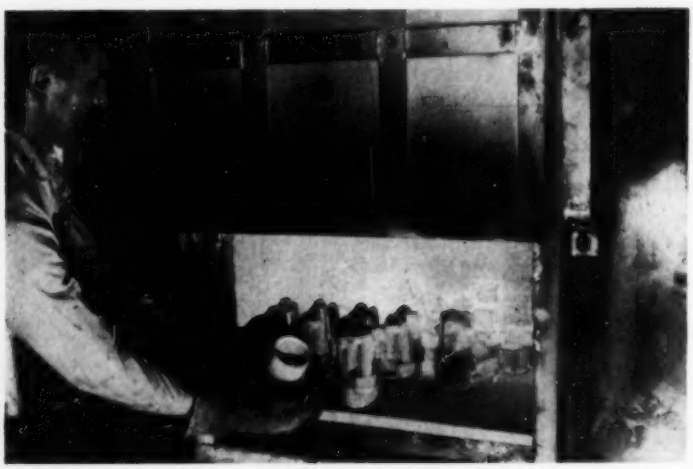
Viscosity of the third and subsequent dip coats is about 1000 cps. A coarser fused silica is used for



Granular refractory is sieved onto the dipped pattern during process of mold build-up



Cutaway mold shows dip and stucco layers forming the shell, smoothness of interior surface, and core in place (lower segment)



After the heat-disposable pattern cluster is melted out, the molds are placed in a high-temperature furnace for burning out residual pattern material and then removed, as shown, for pouring

Pattern clusters are hung on racks in a stream of air supplied by fans for drying between each dip-stucco coating

stuccoing. It measures about 0.050 to 0.070 in. on the major axis. Drying time between coats is 45 minutes to an hour. The final coat is dried for a minimum of 4 hr and generally overnight. Simple mold shapes require a lesser drying time.

The total number of coats depends on size and complexity of the mold. As a rule there are five to seven coats, and the final mold is 3/16 to ½-in. thick.

Pattern Removal—The wooden dipping handle is unscrewed from the nut in the base of the wax sprue. The mold assembly is suspended upside down over a gas-fired melt-out furnace held at about 1800° F. Sliding doors at the top of the furnace are opened and the mold lowered slowly into the furnace and the doors closed.

The high temperature is transmitted through the investment shell quickly, resulting in rapid wax elimination. The low expansion refractory materials used in making the shell molds reduces distortion and cracking problems. Wax is caught in a pan at the bottom of the furnace and reused for sprue, runner, and pouring basin patterns.

Molds are in the melt-out furnace for 5 to 7 minutes, then removed to storage or to another furnace where they remain for 1 hr at 1800-2000° F to burn out residual wax and carbonaceous material. They are ready for pouring upon removal from the furnace.

Pouring the Molds—The hot investment shells are poured in air or in a partial vacuum. Air-poured molds are nestled in coarse sand in the bottom of a bucket to hold them upright. Workers place the buckets on steel plates on a waist-high roller conveyor in front of a tilting induction furnace. Poured molds are rolled to the side for cooling.

Direct pouring from the furnace is used to eliminate heat loss in the metal, occurring during transfer to pouring ladles. Pouring at as high a temperature as feasible is advantageous for investment shell molds because of the high rate of heat

transfer through the shells and consequent chilling action. Exothermic powder is sprinkled on top of the risers to help keep them fluid and aid feeding of the casting.

Castings Cleaning—When metal has solidified in the molds they are removed from the pouring buckets and set on flat bed trucks for complete cooling before movement to the cleaning room. During cooling, much of the mold material spalls off the casting.

In the cleaning room each tree of castings is set on end on a rubber pad and a pneumatic hammer pressed against the pouring basin to shake off the mold material. Depending upon casting configuration and amount of mold material still adhering to the casting, ferrous parts are removed from the sprue immediately with abrasive cut-off wheels or the trees go directly to a series of chemical cleaning baths. Castings which are cut off at this point are cleaned in the chemical baths later.

Ferrous castings are loaded into metal baskets and immersed in a caustic soda salt bath (molten sodium hydroxide) at 900° F for a few minutes or several hours, depending on casting configuration and the amount of mold material adhering to the castings. Then they are immersed in a room-temperature water bath. The reaction between the hot castings and the comparatively cool water blasts off mold material, and the water dissolves the salt.

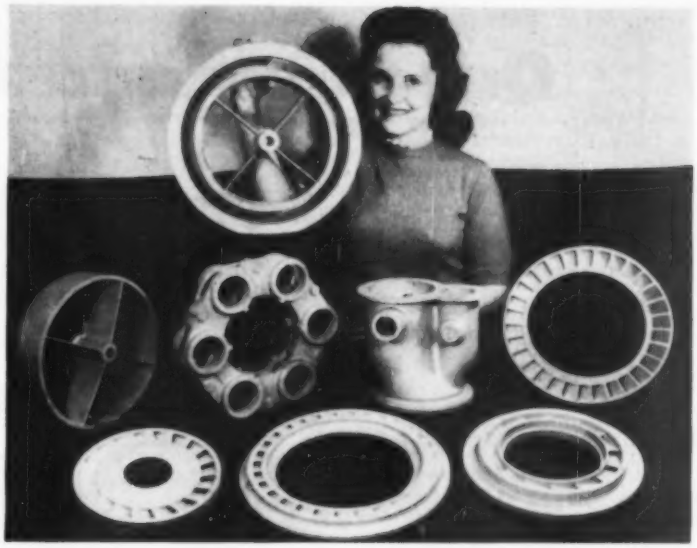
Next step is a room-temperature, neutralizing bath followed by rinsing in water at 200° F. After air drying, the castings are sand blasted. Finally, the castings are ground on wheel or belt equipment, on automatic equipment, or with mounted points, depending upon the casting which is being produced.

Mold material adhering to nonferrous castings, which can not be subjected to the salt and acid treatment, is removed in sand blast cabinets or in tumble-blast machines. Generally, mold material does not adhere to most nonferrous castings as it does to ferrous castings and is removed more easily.

Quality Control—Stringent control procedures over processes and inspection assure production of good quality castings and a low rate of customer rejects. Pilot and first production runs of castings are x-rayed, surface inspected, and checked dimensionally to assure that proper production procedures have been instituted to produce parts conforming to specifications.

During production, castings are subjected to routine visual and dimensional checks, and, if specifications require, x-ray and surface inspection techniques are employed.

Because of the intricacy, close dimensional tolerance, and fine surface finish required for many of the castings produced, a majority of them are packed individually in sectionalized, corrugated boxes for shipment. This is another way of preserving for the customer the high quality engineered into the cast part.



These are typical of the larger cast parts which can be produced in ceramic shell investment molds. These are cast one in a mold

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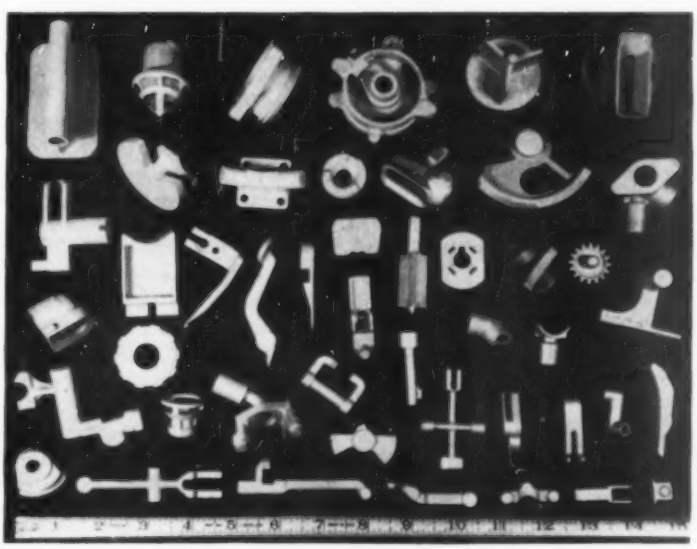
Examples of smaller investment-shell-cast parts are shown below. Several identical parts in this size range are cast in one mold



Questions and Answers

High-frequency induction furnace functions essentially as a melting unit . . . Alloyed gray cast iron is required to withstand attack of molten zinc . . . Cupola practice in melting high-steel charges . . . Shrink fitting

Melting Stainless Steel

In our foundry in India we recently installed two high-frequency induction melting furnaces of 500 and 750 lb capacity. We tried to produce stainless steel castings but ran into difficulties, and wonder if you could offer us any suggestions. It is difficult for us to procure stainless steel scrap of 18-8 quality, and the ferrochromium available here contains 6 to 7 per cent carbon. Hence, the stainless steel we produce is too high in carbon.

We inquired about the oxygen lancing method, and were informed that it is not suitable in high-frequency furnaces. Perhaps we should use electrolytic chromium for the necessary alloying, and would like to know if it would be suitable. Could we use chrome ore for making the necessary chromium additions to the base steel? Can you give us any information on the losses of carbon, silicon, manganese, and chromium in high-frequency induction melting?

When melting with high-frequency induction furnaces, the charged materials must be selected so that the final composition of the various elements is within the desired limits. In such furnaces the recoveries are indicated as 100 per cent for carbon, 94 per cent for silicon, 90 per cent for manganese, and 99 per cent for chromium.

Under the conditions you mention, it will be necessary to make the chromium additions as electrolytic chromium or low-carbon ferrochromium containing less than 0.50 per cent carbon. Limiting carbon content of the ferrochromium will depend on the carbon content of the base steel, and the carbon specification limit in the stainless steel.

One method of overcoming your problems would be to install a direct arc furnace to produce stainless steel from the available materials. It would permit carbon reduction by oxygen lancing or by boiling through ore additions as well as other refining reactions. The steel produced would be poured into castings, and the gates, risers, and other returns from that operation would form the stock material for the high-frequency furnaces.

Alloy Melting Pots for Zinc

We are at present making cast iron pots for the melting of zinc which is 99.99 per cent pure, and is melted and poured at 870° F. Our problem is to make pots which will stand up to that service. The zinc seems to eat into or erode both the walls and bottoms of the pots very rapidly. Can you suggest any ideas or aid for a suitable alloy for this service?

An alloy iron which is reported to serve satisfactorily for melting zinc-base alloys undoubtedly will do as well for pure zinc. The composition shows the following range: 1.00 to 2.00 per cent Si, 0.60 to 0.75 per cent Mn, 3.00 to 3.50 per cent TC, 2.00 to 2.50 per cent Ni, 1.10 to 1.20 per cent Cr, and 0.40 to 0.60 per cent Mo. To improve resistance to attack by zinc the pots are heat treated to provide an oxidized surface, and that is accomplished by heating at 1200 to 1400° F and slowly cooling to room temperature at the rate of 30 to 100° per hr or in 12 to 40 hr.

Further build-up of the oxide coating is obtained by storing the pots outside where they are exposed to the atmosphere, and in one instance it is suggested that the pots be filled with a salt water solution to accelerate oxidation or rusting. Just prior to placing the pot in operation it should be cleaned thoroughly to remove any loose oxide coating. Additional protection for the inside of the pot may be obtained by application of a refractory coating preferably containing an appreciable amount of iron oxide. Pot should be heated to about 200° F when the coating is applied, and thin layers are preferable to thick ones since the latter tend to flake off.

Melting High Steel Charges

We operate an engineering works in Pakistan and intend to install a regenerative-type hot-blast cupola for melting steel scrap charges for the production of pig iron with addition of ferroalloys in the ladle which under local conditions appears to be economical. Can you advise us of the complete process and inform us if it will be technically feasible, keeping in view that there is no carbon deficiency even if the charges are all steel scrap?

While you mention production of pig iron from steel scrap, we suspect that you mean molten cast iron which will be taken from the cupola and used for making gray iron castings. However, in either case the melting procedures would be similar. Steel scrap to be melted should not be too thin in section since such material tends to oxidize easily with attendant higher losses. Dimensions of the pieces should be such that none is over one-third the diameter of the cupola, and they should not be too small since the metal charges may become too dense for satisfactory melting.

With all-steel scrap charges more coke will have to be used between charges than in the case of charges containing cast iron scrap and pig iron. That is necessary to provide additional carbon for absorption by the steel. Figure commonly used for the extra coke is 3 lb for each 100 lb of steel scrap. Usually with all-steel scrap charges the bed is

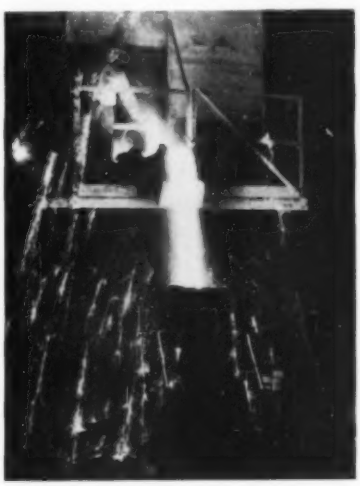
higher than in the case of mixed charges. Normal bed height for a cupola is based on the normal windbox pressure, and the height in inches ranges from 10.5 times the square root of the wind pressure in ounces to that value plus 6. In other words if the blast pressure is 16 oz, the bed height may range from 42 to 48 in. above the tops of the tuyeres.

Suggested practice in arranging the coke and metal charge weights is to hold the weight of the coke split constant, and vary the metal charge weight to establish suitable metal temperatures and melting rate. Weight of the coke split will depend upon the cross sectional area of the cupola. In this country a 42 in. ID cupola would use 110-lb coke splits while a 48 in. ID cupola would employ 145-lb coke splits. That represents a coke layer about 5 in. deep in the cupolas. The iron to coke ratio is adjusted according to quality of the coke, and desired iron temperature, and may range from 6 lb iron to 1 lb coke to 12 lb iron to 1 lb coke. With high steel scrap metal charges we would expect the iron to coke ratios to be on the low side rather than the high, but the most suitable one will have to be determined by experiment.

Amount of air required for operation can be determined from the fact that 151.5 cu ft of air at 60° F and 29.92 in. mercury or 14.7 psi are required to burn completely 1 lb pure carbon. Since coke is not pure carbon, the amount of air needed for complete combustion will be less. For example if a cupola is melting 8000 lb of iron per hour with an iron to coke ratio of 8:1, 1000 lb of coke would be burned in that period. If the coke contains 90 per cent carbon, the amount of carbon would be 900 lb, and 136,350 cu ft of air per hour would be required, or 2272 cu ft per minute.

Some fluxing material such as limestone will be needed to take care of the ash in the coke, that portion of the refractory lining consumed during the heat, and dirt and extraneous matter on the raw materials. Usually the amount of limestone is 3 per cent of the iron weight, but may be more or less depending upon the factors enumerated.

It might be pointed out that with high steel scrap charges, the total carbon content of the iron will be around 3 per cent in the regular acid-lined cupola. If higher carbon content is desired it will be necessary to employ a basic lining in the cupola, or inject graphite into the molten metal with nitrogen as the carrier. By the latter procedure one foundry increased carbon in the iron from 3.15 per cent to 3.50 per cent and decreased the sulfur from 0.120 per cent to 0.060 per cent by injecting graphite and calcium carbide simultaneously. The procedure was described



in the article "Injection Process Permits Use of High-Scrap Cupola Charge" by Murray Cohen which appeared in the March, 1957, issue of FOUNDRY.

With all-steel charges, assuming that the silicon content is 0.25 per cent and the manganese 0.50 per cent, ferroalloys will have to be added as you mention to bring those up to the desired point for use in gray iron castings—perhaps 2.0 per cent silicon and 0.60 per cent manganese. Calculations indicate that about 2 lb, 11 oz of 75 per cent ferromanganese and 39.5 lb of 50 per cent ferrosilicon will be required per 1000 lb of iron. While addition of the required amount of ferromanganese to the ladle should not cause any difficulty, the addition of the large amount of ferrosilicon may result in loss of temperature in the metal, and it may be advisable to add the major portion along with the iron charge.

A preferable method of adding ferroalloys to the ladle is to place them in a cylindrical container or hopper over the cupola spout. The hopper should have a conical bottom with an orifice or opening into which a pointed rod is fitted to act as a needle valve. By adjusting the end of the rod in relation to the hole, the flow of material can be controlled to provide various feeding rates.

Shrink Fitting with Dry Ice

We will appreciate any information relating to the "dry ice freezing" of a cast iron bushing or liner to fit it into a pump cylinder. The bushing is 16½ in. OD, 15 in. ID, and 16 in. long. How long will it have to be in the dry ice, and what will be the shrinkage? We would like it to be 0.0004 or 0.0005 in. tight in the cylinder.

The coefficient of thermal expansion for gray iron varies to some extent with composition and temperature. It is higher for ferritic type irons than for pearlitic irons, and is lower at low temperatures than at higher temperatures. In the case under consideration, however, we believe that average value of 0.000006 in. per in. per degree F can be used satisfactorily. Hence a gray iron bushing 16½ in. in diam will shrink 0.000099 in. per degree F on cooling or expand that amount in heating.

Dry ice has a temperature of about minus 110° F at atmospheric pressure when surrounded by its own gas, but when changing from the solid to the gaseous state the temperature may be as low as minus 135° F. If we assume that in cooling the gray iron bushing, the temperature is midway between the two temperatures or about minus 120° F, the total contraction of the diameter would be 0.000099 times the temperature difference between room temperature and dry ice temperature. Difference between room temperature of 70° F and dry ice at minus 120° F is 190°, and the total contraction will be 0.0188 in. In other words, when the bushing is cooled to the dry ice temperature it will be 16.4812 in. in diam.

To accelerate cooling, we believe the most suitable procedure is to stand the bushing upright so that the dry ice can be placed in the interior as well as around the exterior. We

do not know how long it will take to obtain the required contraction so you will have to experiment. We would expect that soaking for one hour would be satisfactory, but it might be accomplished in less time. Perform the shrinking operation close to the cylinder into which the bushing will be fitted so that the minimum time is required to move the bushing from the dry ice container into the cylinder.

Chromate Finish on Castings

Can you give us any information on a chromate or dichromate finish for castings?

Since both aluminum alloy and magnesium alloy castings are given finishes with chromium compounds, and you did not indicate the particular material, we will describe both types. One chromate treatment for aluminum alloys, usually applied to promote paint adhesion, consists of immersing the castings in a 5 to 10 per cent chromic acid solution at 140 to 150° F for about 5 minutes. Castings are rinsed in cold water and dried.

For magnesium alloy castings either of two baths may be used. One is composed of 1½ lb sodium dichromate and 1½ pints concentrated nitric acid in 1 gallon of water. The other consists of 1 lb chromium trioxide and 0.9 pint nitric acid in 1 gallon of water. Parts are immersed for about 1 minute, rinsed in hot water and dried in an air blast.

Sand Expansion Causes Scabs

When producing thin-wall (stoveplate) gray iron castings weighing about 35 lb we have difficulty with scabs when the sand is at a temperature of 95° F. The sand is semi-synthetic with a moisture content of 4½ per cent, permeability of 32.5, compression strength 21 psi, and shear strength 400. Can you tell us how to prevent the occurrence of scabs? Also we would like to know what sand cooling is recommended for working up to 100 tons of sand per hour.

Formation of scabs is a sand expansion problem resulting from fracture of the mold wall, and we do not believe that the temperature of the sand at the time of molding has any effect. Scabbing tendency of sand can be remedied by use of some type of cushioning agent such as wood flour, cereal, etc., which burns out leaving voids into which the sand can expand.

Hot sand, of course, will cause trouble such as stickdowns or sand sticking to the pattern, and lack of strength resulting in loose sand or dirt. The sand temperature at which these difficulties happen, however, usually is somewhat above the 95° you mention. Indications are that sand cooled to 110° or 120° F will operate satisfactorily.

Various types of equipment are available for cooling sand. They include rotary screens or louvered cylinders, perforated metal conveyors, and rotating shelf type units arranged so that cooling air is blown through the sand. Water is added to the hot sand prior to its entrance into the unit to aid the cooling through evaporation.

Another solution is to increase the sand supply so that it has more time for cooling before being reused.

Seeks Dimensions for Cupola

We operate a foundry in Chile and would like to obtain information on a cupola to melt 2000 kg per hour. We have consulted several texts to determine the necessary dimensions but the data seem vague and variable. Also we would like to have information on the size of blower as well as the air pressure for operating the cupola.

For purpose of calculation it usually is assumed that a cupola will melt about 10 lb of iron per sq in. of cross-sectional area per hour or 0.703 kg per sq cm per hour. On that basis, to melt 2000 kg per hour a cupola lined to 60 cm in diam would be required.

In operation of the cupola it is recommended that the weight of the coke charges or splits between the iron charges be held constant, and that the weight of the iron charges be varied to obtain suitable melting temperatures and rates. Some suggested coke weights between charges indicate that they are based on a depth of 5 in. in the cupola with a coke weighing about 28 lb per cu ft. In the metric system the depth would be 12.7 cm, and the coke weight 448.56 kg per cu m. Using those figures the coke split between charges would weigh 16.2 kg, but we suggest that it be increased to 18 kg. With an iron-to-coke ratio of 8:1, the iron charge would weigh 144 kg.

To determine the amount of air required to melt 2000 kg of iron per hour with an iron-ratio of 8:1, the figure of 130 cu ft per lb of coke (90 per cent C) or 8.12 cu m per kg can be used. Calculation indicates that 33.83 cu m per minute of air will be required, but it is advisable that the blower have a capacity of 10 to 11 per cent greater or, in round numbers, a capacity of 37.5 cu m per minute.

Discharge pressure of the blower should be about 16 oz per sq in. (0.0703 kg per sq cm) or 703 mm of water. Tuyere area should be about 20 per cent of the cross-sectional area of the cupola or 565.2 sq cm, and four tuyeres 13.4 cm in diam should serve. We believe it is preferable to arrange the tuyeres to point down at 10 to 12 degrees.

Height of the tuyeres above the sand bottom will depend on the quantity of iron to be held in the cupola well between tappings. It can be determined by multiplying the volume of the iron to be held in the well by two since the iron will occupy about 50 per cent of the volume below the tuyeres. From that figure and the cross-sectional area of the cupola, the height of the tuyeres can be ascertained.

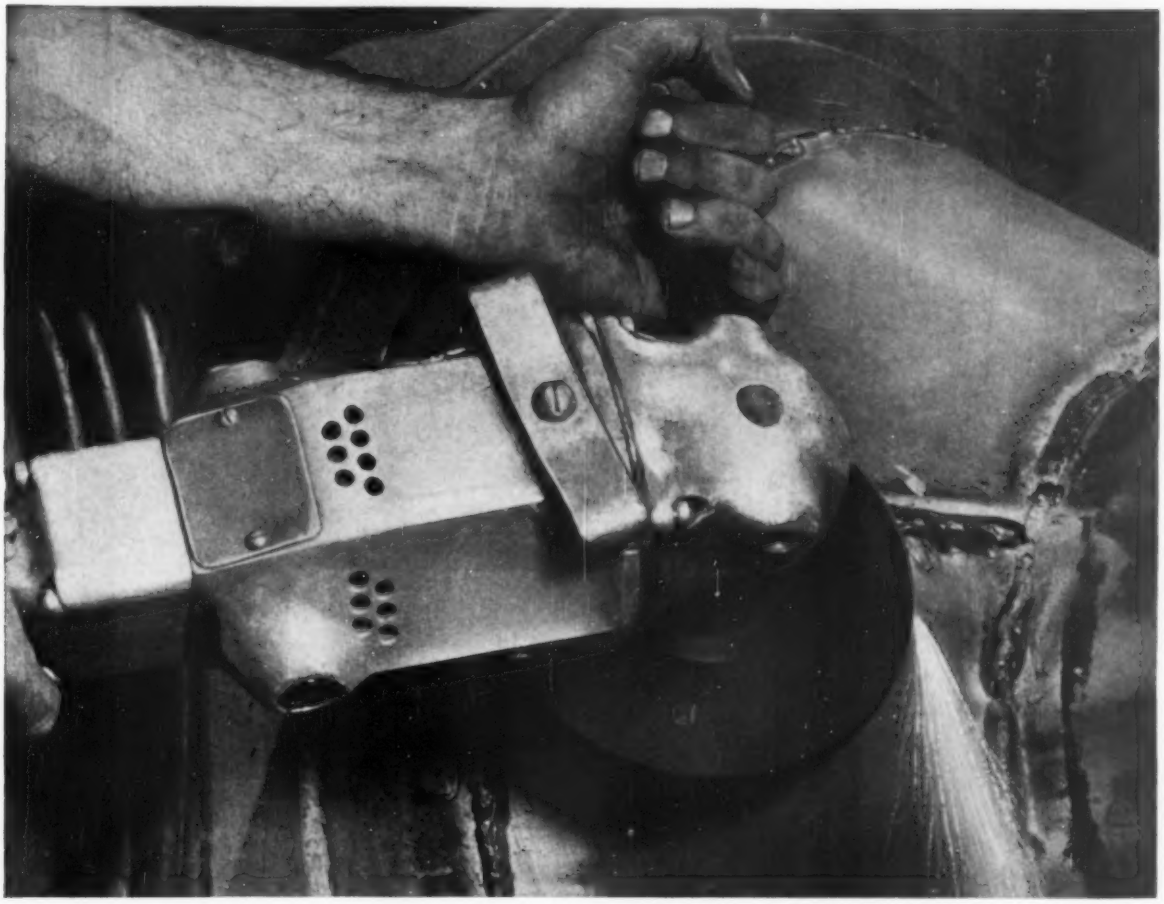
Methods of Pressure Testing

Can you supply us with any information on the procedure used in hydrostatic testing of castings?

Two practices generally are employed to test hollow castings to determine if they are leakproof at a given pressure. In both methods all openings into the casting except one are closed with suitable clamping and sealing devices—usually designed for the specific casting. In one method water or other suitable fluid is forced into the interior through the only opening, and then the exterior surface is examined visually for evidence of leakage.

In the other method, air under pressure is forced into the casting, which then is submerged in water. Presence of air bubbles rising from the casting indicates leakage. A variation of the air pressure test is to paint the casting with a soap solution instead of immersing it in water.

FLEXLITE RAISED HUB GRINDING WHEELS



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Designed and built into a compact package, the "Unitized Control System" is a systematic arrangement of electrical controls, neatly wired to a terminal board for simple and easy connection to oven-mounted components. Because all electrical components are prewired and tested at the factory, Hevi-Duty assures reliability of control for continuous oven operation. A schematic wiring diagram, furnished with each control system, clearly shows each terminal of all controls. This, too, helps minimize installation and maintenance costs.

With "Unitized Control," you can be sure of a precise control system flexible in design . . . easy to maintain . . . neat in appearance.

A typical "Unitized Control System" for ovens consists of: cover interlock disconnect, when required by code; fuse for each phase of heater, motor and control circuits; thermal-overload protected starter for each motor, with thermal-overloads connected in series to coil of control relay; purge timer for all control systems involving combustible products or fuels; a flame-fail relay for each fuel-fired burner; sequence relays and timers for all processes involving automatic sequence of operations, and control transformer.

"Unitized Control System" is standard on all Hevi-Duty industrial ovens. For more information contact Hevi-Duty.

HEVI-DUTY

BULLETIN! *For information on continuous and batch type Hevi-Duty ovens, write for Bulletin 159.*

A DIVISION OF BPC BASIC PRODUCTS CORPORATION

HEVI-DUTY ELECTRIC COMPANY, MILWAUKEE 1, WISCONSIN

Industrial Furnaces and Ovens, Electric and Fuel • Laboratory Furnaces • Dry Type Transformers • Constant Current Regulators

For More Information
Use Reply Card—Page 53

What's New in Equipment and Supplies

LIQUID OXYGEN MANIFOLD

Used with four liquid oxygen cylinders, the Oxweld M-40 provides an uninterrupted supply of 12,000

cu ft of oxygen. As the supply in one cylinder bank is depleted, the manifold automatically continues to supply oxygen from the other bank. Standard models are supplied for use with four or two cylinders arranged in two banks. —**Linde Co.**, division of Union Carbide Corp., 420 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 450—Page 53

HOSE COUPLING

Automatic coupling device is claimed to provide fast, efficient method for coupling and uncoupling air hoses. Flex-O-Matic coupling is offered in four sizes, for 1/4, 3/8, 1/2, and 3/4-in. I.D. hose. No tools are required. A straight push connects the plug, locking it firmly in the socket regardless of air pressure. A slight pull on the knurled sleeve disconnects socket and plug, automatically shutting off air. Precision-fitted seal prevents leakage, and swivel action prevents kinking of the hose. —**Lincoln Engineering Co.**, 4010 Goodfellow Blvd., St. Louis 20, Mo.

For More Details Circle No. 451—Page 53

SAFETY GLOVES

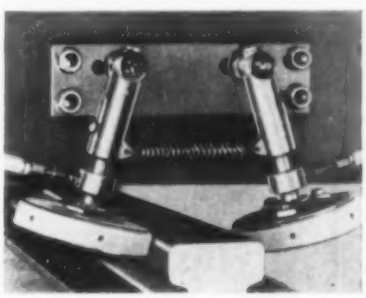
Four types of safety gloves have been made for light welding and general industrial work. Type E-GR is chrome tanned, green cowhide with a full gauntlet for light welding when protection of hand, wrist and lower arm is necessary. D-SS is of chrome tanned cowhide with reinforcements at gauntlet seam, palm seam, and thumb crotch. Type AR-1 is a high-grade heat resistant green leather welder's mitten designed to allow freedom of movement for the thumb and index finger, and type GR-SS is a flex-

ible, driver-style glove for miscellaneous work where light protection is required.—**Air Reduction Sales Co.**, division of Air Reduction Co., 150 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 452—Page 53

CRANE RAIL LUBRICATOR

Crane rail lubricator is claimed to reduce wheel flange and crane rail wear. Because of its adjustable construction, the system can be used on any size rail or crane. A thin film of lubricant is applied automatically without touching the top surface of the rails. The lubricator is offered in single rail, double rail,



and combined crane and crane rail models. All systems can be supplied motorized, with motors in series with the long travel motor.—**Research Appliance Co., Lubrication Div.**, P. O. Box 307, Allison Park, Pa.

For More Details Circle No. 453—Page 53

UNIVERSAL HOIST

Universal hoist's antifouling mechanism consists of a spring shroud device covering the drum. The device separates the width of the cable for orderly, efficient reel-in, reel-out operations. The 47-lb hoist is operated electrically or manually and has a lifting capacity of more than 6000 lb. The unit is the size of a tank-type vacuum cleaner and is powered by a three-

phase, 400-cycle reversible ac motor. The planetary gearing is irreversible, eliminating the danger of involuntary release of the load when operated by hand.—**AiResearch Mfg. Div., Garrett Corp.**, 9851 Sepulveda Blvd., Los Angeles, Calif.

For More Details Circle No. 454—Page 53

FIRE ALARM

Heat sensitive, self-pressurized fire alarm has a patented visual glass eye monitor. The alarm is U/L approved for 1500 ft of tubing in a single one-horn system and for use with two horns in one system. The unit also is manufactured as a single-station, horn-mounted, home type which can be hung from the ceiling. When the temperature reaches the unit's operating point, pressure is released to activate the signal horn.

The units are connected with ¼-in. aluminum tubing and U/L approved for 400-sq-ft spacing. The alarm contains 20 oz min. DuPont freon and is 9¼ in. high and 3 in. in diam.—**Standard Fire Alarm & Signal Inc.**, 100 Old York Rd., Jenkintown, Pa.

For More Details Circle No. 455—Page 53

LIFTING TAILGATE

Hide-A-Gate folds under a truck or trailer body to allow direct contact by body bumpers against a loading dock. The lifting tailgate is out of the way for dock to fork truck loading. The gate comes out for lifting and lowering up to a 1200-lb payload where dock facilities do not exist. The unit is electric hydraulic or P.T.O. hydraulic and mounts to 1½ ton and larger trucks.—**H. S. Watson Co.**, 1316 67th St., Emeryville 8, Calif.

For More Details Circle No. 456—Page 53

PORTABLE SCREEN

Four-sided screen for safety in work which requires complete enclosure is constructed of 1-in. tubular steel with a black oxide finish. The slip joint construction facilitates easy assembly. The 6-ft screen weighs 85 lb and is available in three materials, 12-oz duck, neoprene-coated fiberglass, and aluminized asbestos. Heavy-duty rubber wheel casters are also available. —**Singer Glove Mfg. Co.**, 860 W. Weed St., Chicago 22, Ill.

For More Details Circle No. 457—Page 53

SAFETY FACE SHIELD

Kool-Vent shield incorporates an optically correct acetate window in a fine, metal, 24-mesh screen 8 x

11½ in. The shield is held securely before the face by an adjustable fiber headband, enabling it to be worn with or without regular prescription eyeglasses. Acetate windows are available clear, green, or aluminized.—**American Optical Co.**, Southbridge, Mass.

For More Details Circle No. 458—Page 53

BARREL FINISHING

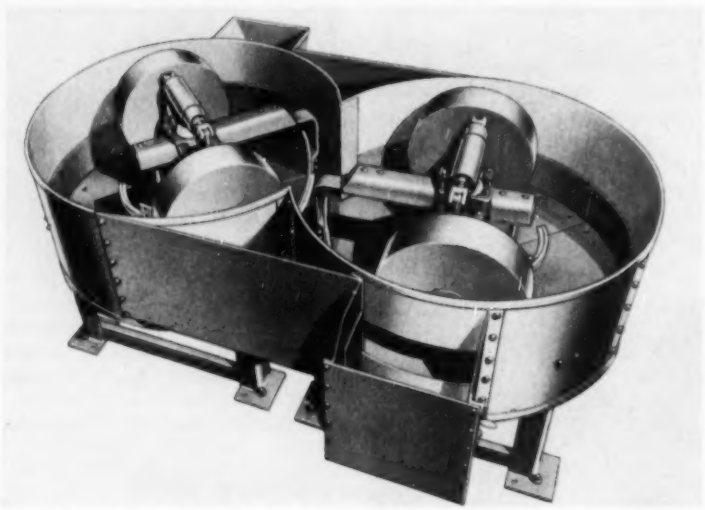
No. 680, a dual-purpose abrasive barrel finishing compound, is claimed to combine extra fast cutting action with fine surface refinement and cleanliness of surface on most metals. It contains no aluminum oxide, so it will not leave an objectionable gray film. Compound helps break surface tension and keeps flat parts from sticking to each other or to the sides of the barrel. —**Esbec Barrel Finishing Corp.**, P. O. Box 929, Stamford, Conn.

For More Details Circle No. 459—Page 53

VISUAL AID PACKAGE

Package of visual aid information has many suggestions for picturing facts graphically for production, scheduling, maintenance, sales, and other applications. Plan sheet is furnished for plotting a system on paper and sample strip of cards can be used to determine the best visible method of posting data on board. The Boardmaster is made of alu-

Machine Provides Continuous Batch Mulling



Multi-Mull is a double muller designed to receive a continuous stream of dry shakeout sand. Bonding materials and water are added continuously, and their addition can be controlled automatically.

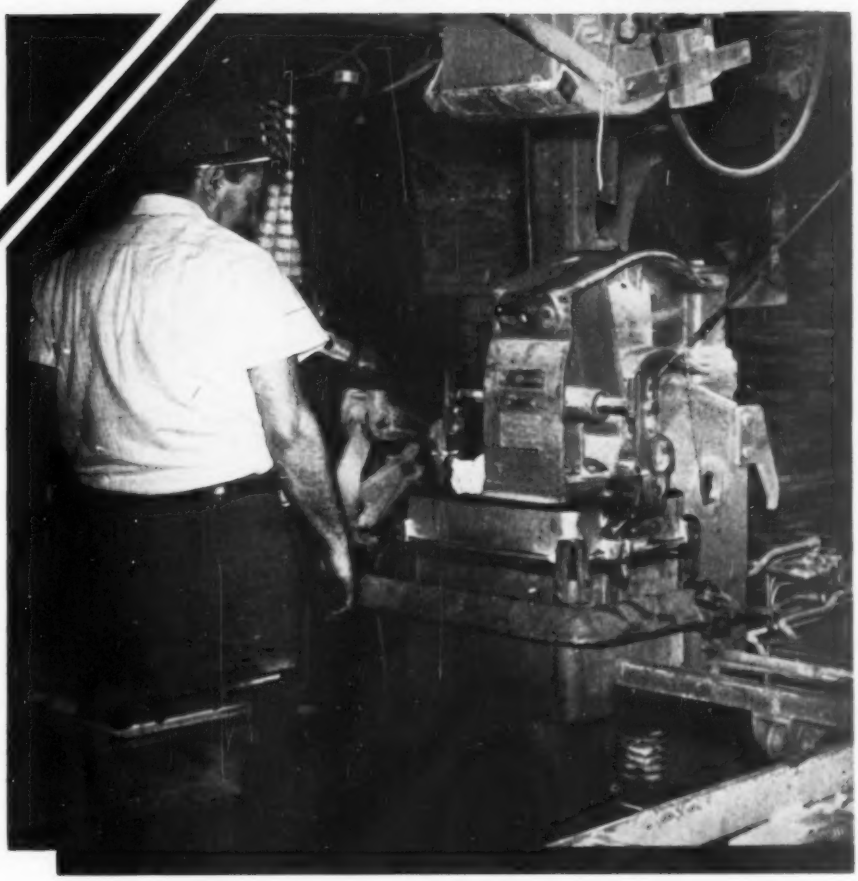
Counter-current action of the two mixers generates intensive recirculation of material between two pans. Multi-Mull is offered in six models and is recommended for use on gray iron and steel sands as well as nonferrous molding sands.—**National Engineering Co.**, 549 W. Washington St., Chicago 6, Ill.

For More Details Circle No. 484—Page 53

PROVED!

IN IRON AND NON-FERROUS FOUNDRIES THRU-OUT NORTH AMERICA

The H.E.B. *FLASKLESS* Machine



Photograph by courtesy of Susquehanna Castings Ltd., North Front Street, Wrightsville, Pennsylvania

- TWO SIZES: 17" X 12" AND 18" X 14"
- OWN HYDRAULIC POWER PACK
- OPERATES AT 750/1000 P.S.I.
- ONE MAN MAKES COPE AND DRAG SIMULTANEOUSLY
- FAST PATTERN CHANGE
- LOW MAINTENANCE COSTS

Proved to be 50% faster than ordinary squeezers. No bands or jackets required for pouring. Cores set in one easy movement. Skill not required in operation.

For further details, write or phone:

U.S. Patents pending. Canadian Patents No. 531479. British Patent No. 748551. Patents granted or pending in other industrial countries.

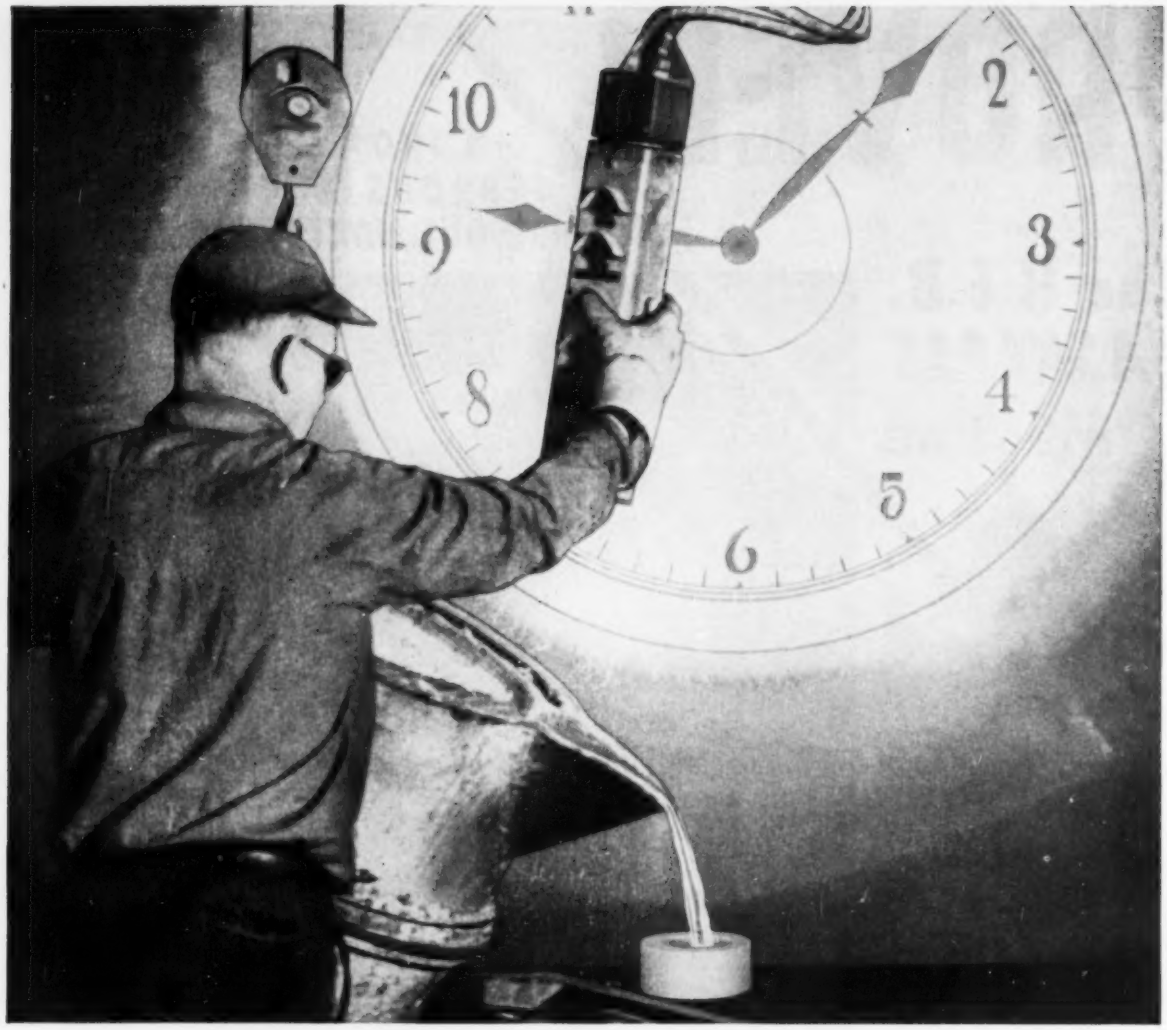
Circle 601 on Page 53

F. E. (NORTH AMERICA) LTD.

47 ADVANCE ROAD, TORONTO 18, ONTARIO

TELEPHONE: BELMONT 3-3227

TELEGRAMS: EQUIPMENT, TORONTO



With new RIS-A-SLEEVS by Johns-Manville . . .

riser metal stays molten . . . precious minutes longer!

Now—for aluminum, brass and bronze casting—a new riser sleeve that contains heat more effectively than any product of its kind!

Here's the kind of riser sleeve you've long hoped would come along!

Developed by Johns-Manville research scientists, RIS-A-SLEEV reduces heat transfer as effectively as an advanced industrial insulation. With heat more effectively contained within the sleeve, you have precious minutes longer to feed small remote areas, and greater assurance that the riser metal will be very last to freeze.

Because RIS-A-SLEEV insulates better, it lets you cut down still further on riser sizes . . . gives you closer control of solidification . . . results in sounder castings and fewer rejects.

And, of course, RIS-A-SLEEV will not contaminate sand. It's ideal, too, for blind risers. Available in complete range of sizes . . . at surprisingly little cost. We invite you to test RIS-A-SLEEV. We'll be pleased to send you samples along with complete information. Write today to Johns-Manville, Box 14, New York 16, New York.

JOHNS-MANVILLE

JOHNS MANVILLE JM PRODUCTS

Circle 602 on Page 53

minum and may be hung on the wall or propped on a desk. Two informative booklets are included in the kit.—**Graphic Systems,** 55 W. 42nd St., New York 36, N. Y.

For More Details Circle No. 460—Page 53

WALL-MOUNTED SHOWER

Wall-mounted shower with one set of piping and two or three shower heads serves several bathers, each with individual control of water volume and temperature. It is particularly suitable for narrow rooms. The unit is self-contained and assembled for mounting at any desired height. Enclosing panel, cornice, and cover are made of stainless or pressed steel, vitreous enameled, and finished in white or a selection of colors.—**Bradley Washfountain Co.,** 2203 W. Michigan Ave., Milwaukee 1, Wis.

For More Details Circle No. 461—Page 53

POWER SUPPLY SYSTEMS

Industrial power supply systems were developed to regulate voltage, current, or power and are wired with all components in a single enclosure. These systems are to

handle input to 15 kv, single phase or three phase, 25-60 cycles; output ratings to 100,000 amp, single phase, two phase, three phase, or direct current. — **Hevi-Duty Electric Co.,** division of Basic Products Corp., 4210 Highland Ave., Milwaukee 1, Wis.

For More Details Circle No. 462—Page 53

VIBRATING TABLE

Pneumatic vibrator table is designed for settling bulk material and removal of light scale from castings. Another possible foundry use would be for vibrating bubbles out of investment mold slurry. The model shown has a 25 x 28-in. table and

overall height, including top-mounted vibrator, of 6 in. Two other stock models and special units are offered. An automatic lubricator, pressure regulator w/gage, and a knee, foot or hand lever valve are supplied with the tables.—**National Air Vibrator Co.,** 435 Literary Rd., Cleveland 13, Ohio.

For More Details Circle No. 463—Page 53

SAFETY GLASSES

M-70 metal frame safety glasses feature a redesigned, expansion-type endpiece that allows easy assembly of lenses and side shields. The same front can be used both with and without side shields, with no alteration of lens size. A choice of six types of shields is offered. Other features include modern styling, simplicity, and ruggedness. —**Safety Products Dept., Bausch & Lomb Optical Co.,** 626 St. Paul St., Rochester 2, N. Y.

For More Details Circle No. 464—Page 53

AIR GRINDERS

New line of 6-in. capacity straight air grinders is said to provide a 100 per cent increase in power with no weight increase. Motor housings are insulated inside a double-wall construction to reduce exhaust noise, cool the motor, and eliminate exhaust port freezing.

Tools are available with butterfly throttles, lever throttles, and grip throttles. An over-speed device automatically cuts the air supply to the motor whenever a governor failure or other condition causes overspeeding. The outer wall of the motor housing can be rotated 360 degrees to deflect the exhaust. Grinders are furnished at speeds of 4500 or 6000 rpm. Special gearing sets wire-brush model speeds at 2000 rpm.—**Thor Power Tool Co.,** 175 N. State St., Aurora, Ill.

For More Details Circle No. 465—Page 53

WORK PLATFORM

Maintenance and work platform can be adjusted to any height from 3 to 7 ft by a manual hydraulic pump on the platform deck. This portable platform has a 1000-lb load capacity. Features include nonskid surface on the platform deck, telescoping ladder for access at any height, and removable safety handrails.—**Aero-Test Equipment Inc.,** P. O. Box 10627, Dallas 7, Texas.

For More Details Circle No. 466—Page 53

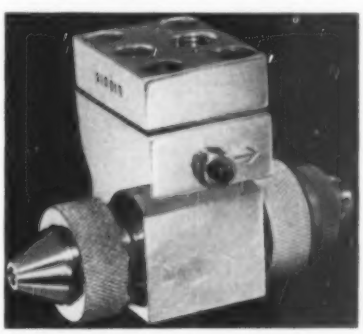
COIL COATING

Kotacoil is designed for maintenance coating of all work coils used in induction heating equipment. This spray is said to prolong coil life by preventing chemical deterioration and reducing the possibility of arcing. Kotacoil is simple to apply, and a work coil can be used again soon after treatment. **Induction Heating Corp.,** Dept. PR-3, 181 Wythe Ave., Brooklyn 11, N. Y.

For More Details Circle No. 457—Page 53

ADJUSTABLE NOZZLE

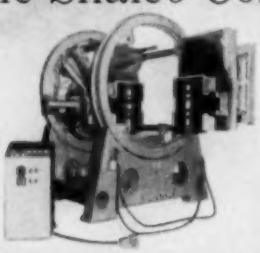
Nozzle with one or two openings sprays one surface or two parallel surfaces at the same time. Separate adjustable fan or cone patterns can be selected for either opening. Positive shutoff is insured for each outlet by individual needle valves.



Metered flow can be adjusted independently for each outlet.

Available in aluminum, brass, or stainless steel, the nozzle is designed for application of sprayable lubricants and can be furnished for use near high-temperature areas. It

The Shalco Corporation, pioneers in Shell Core Blowers and Shell Molding Machines, joins forces and becomes a Division of the National Acme Company, pioneers in automatic multiple-spindle bar and chucking machines



The National Acme Company

EXECUTIVE OFFICES: 170 EAST 131st STREET, CLEVELAND 8, OHIO • GLENVILLE 1-9080

To The Foundry Industry:

Our "Zone of Responsibility" to the metalworking industry is constantly being broadened to include almost every production step from raw material to the finished product. In joining forces with National Acme, Shalco's exclusive developments and broad experience in the art of shell molding is combined with 75 years' experience in automatic machine tool manufacturing and servicing. The result is shell molding equipment built to the highest standards of machine tool precision and reliability.

Shalco's unique design and manufacturing techniques have resulted in low cost, greatly simplified Shell Core Blowers and Shell Molding Machines with unusual flexibility. We believe this outstanding equipment will now allow the Foundry Industry to take greater advantage of the economy, precision and high quality realized with shell molded castings.

One of the most complete engineering and application services in the industry is available to assist foundrymen everywhere in obtaining optimum results from this outstanding process.

T. L. Stringfellow

President
The National Acme Company

will handle materials with chemically active or abrasive properties. —**Columbus Automatic Lubrication Co.**, 81 E. State St., Columbus 15, Ohio.

For More Details Circle No. 468—Page 53

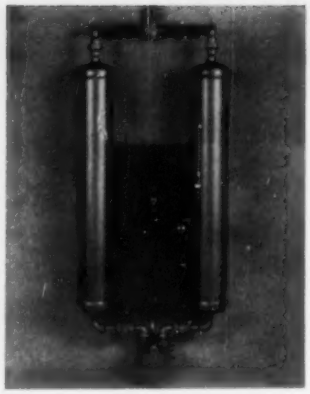
GAS PROPORTIONING VALVES

Varitrol gas proportioning valves can be operated manually or automatically. They permit proper setting for any firing condition without trial-and-error adjustments. The air-fuel ratio can be adjusted precisely for each valve position because the unit is provided with nine individual gas-adjusting screws. Mounting bases and the required connecting linkages can be furnished to accommodate a wide variety of industrial control motors or air diaphragms.—**Eclipse Fuel Engineering Co.**, 1100 Buchanan St., Rockford, Ill.

For More Details Circle No. 469—Page 53

AIR DRYER

Dryer for drying small quantities of compressed air, from 1 to 25 scfm, with inlet pressures up to 125 psig and inlet temperatures up to 120° F, is fully automatic. It uses a small amount of heat for reactivation. Only moving parts are a timer and a solenoid-type, four-way valve. Desiccant towers are disposable and easily replaced. Heaters are permanently embedded. Built-in dust filters assure clean, dry air



at dew points down to −60° F or below.—**Desomatic Products Inc.**, 1109 W. Broad St., Falls Church, Va.

For More Details Circle No. 470—Page 53

SINGLE-STAGE COMPRESSORS

Redesigned line of single stage compressors consists of three styles, B, C, and D, suitable for a wide range of applications including cupola blowing. The B style compressor, designed for low-pressure, low-volume service, is close coupled to a standard round frame, flange type, 3600-rpm motor mounted on the compressor backplate. C style is a base-mounted, pedestal bearing machine incorporating self-aligning ball bearings. D style is capable of higher pressure ratios, greater volume, and greater flexibility. Its bracket-mounted, pivoted shoe bearings are suited for high-speed application.—**Allis Chalmers Mfg. Co.**, Milwaukee 1, Wis.

For More Details Circle No. 471—Page 53

RAMMING MIX

Aluram, an 85 per cent alumina ramming mix, is recommended for lower sidewalls and bottoms of aluminum melting and holding furnaces because of its high resistance to penetration by molten aluminum and slags. It is said to eliminate joints, to have a strong structure, and to have a stable volume, eliminating shrinkage and creep and travel of brickwork.—**Refractories Div., H. K. Porter Co.**, Porter Building, Pittsburgh 19, Pa.

For More Details Circle No. 472—Page 53

ELECTRONIC INDICATOR

Model 721 electronic indicator is used to indicate values of flow, liquid level, temperature, pressure, position, input motion, per cent O_2, per cent CO_2, per cent H_2, pH, resistance, and dc millivolts. It has a 4.4 second pointer travel over the full scale, with 300 degree indication and total scale length of 12¾ in. Either one of two electronic receiver units — differential transformer or slidewire—can be incorporated for operation with suitable transmitters. Accessory terminals and adjustments are readily available when the door of the unit is open.—**Hays Corp.**, 742 E. Eighth St., Michigan City, Ind.

For More Details Circle No. 473—Page 53

AIR LINE FILTER

Air line filter drains automatically. The filter incorporates a float which admits air to a pilot valve chamber whenever liquid accumulates, opening a scavenger valve. Trapped liquid and impurities then are blown out the drain opening. The Auto-Drain filter is made in sizes from ¼ to 1 in.—**Industrial Div., Watts Regulator Co.**, 10 Embankment Rd., Lawrence, Mass.

For More Details Circle No. 474—Page 53

CREEP TESTING MACHINES

Testing machines available in two models—140 to 6000 lb or 280 to 12,000-lb capacity—are designed to assure uniform load application for indefinite periods. Testing temperatures to 2462° F are maintained within ±2° F by an integral ther-

Core Blower Features Rugged Construction

Shell Master CBM-1 coreblower assures accurate alignment with long-wearing chrome guide bars and replaceable nylon bushings protected by oil seals. Hollow guide bars transfer a minimum of heat. Four adjusting studs on each side simplify perfect parallelism between corebox faces. Clamping air piston is mounted on the center line of the machine. Extra room between corebox and blow plate eases loading of sand into hopper. Unit will handle any corebox up to 11 in. high, 13 in. wide, and 10 in. deep. It will produce up to 120 cycles per hour. Sand hopper capacity is 70 lb.—**F. E. (North America) Ltd.**, 47 Advance Rd., Toronto 18, Canada.

For More Details Circle No. 485—Page 53

Every single piece made using one Cities Service Core Oil!

From the size of a pin to the size of a truck engine, Cities Service Delco 60 makes them all!

The way Fred Weir has expanded the uses of one core oil is typical of the way he's expanded his entire business.

In 1941, Weir Foundry consisted of a one-car garage. Today, its modern plant pours ten tons of metal a day, and its castings include parts for food choppers, dough mixers, dishwashers, road machinery, plumbing fixtures, door assemblies, pumps, and paper cutters.

The Weir Machine & Foundry Co. is particularly proud of two things: the Nicast process (licensed from International Nickel Co.) by which they produce castings resembling stainless steel and the success they have had with Cities Service Delco 60 Core Oil.

A good many people have doubted the ability of any core oil, no matter how good, to accomplish the many jobs shown above. But under the supervision of Charles Fish, the core room foreman, they were proven wrong. Says Mr. Fish: "The uniformity of Delco 60 and its astounding versatility have been a factor in our growth. There seems to be nothing the oil can't do . . . and its baking and shake-out qualities are always excellent."

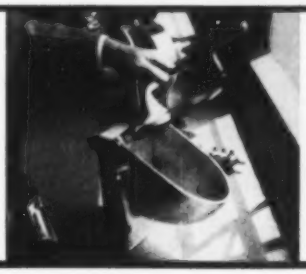
As a tribute to their versatility, Weir Machine & Foundry Co., Inc. was recently awarded a license to produce Ductile Iron castings to further extend their services to their customers.

Again and again, where cores are intricate, production diversified, and schedules tight—you'll find Cities Service Delco Core Oils. Find out what they'll do for you. Talk with a Cities Service Core Oil Specialist. Or write: Cities Service Oil Company, 20 North Wacker Drive, Chicago 6, Illinois.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

. . . and it all started in a garage. Weir's modern foundry, pouring ten tons of castings per day, is a far cry from the one-car garage in which the business began in 1941.



Nicast Process, licensed to Weir by International Nickel Company, produces food machinery castings with remarkable finish. Weir is one of the two licensees in the state.

LET'S LOOK at

OVENS for every baking requirement

OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

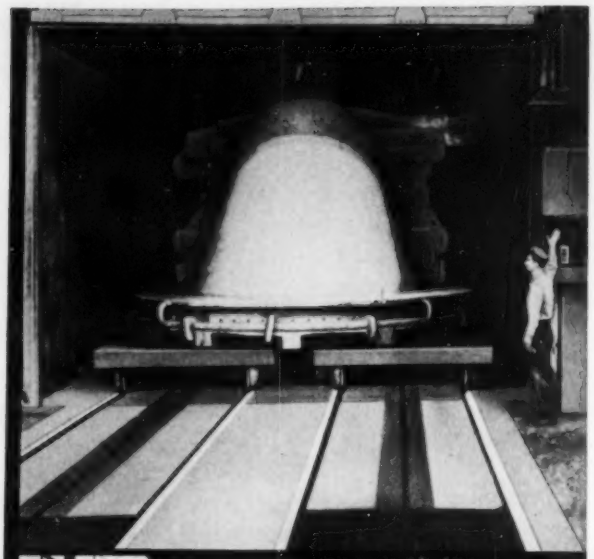
Write for Bulletin 53-CM

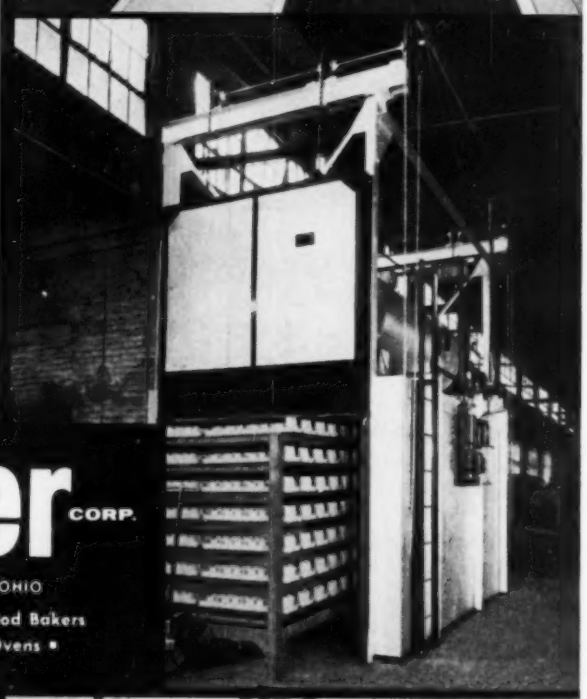
TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.

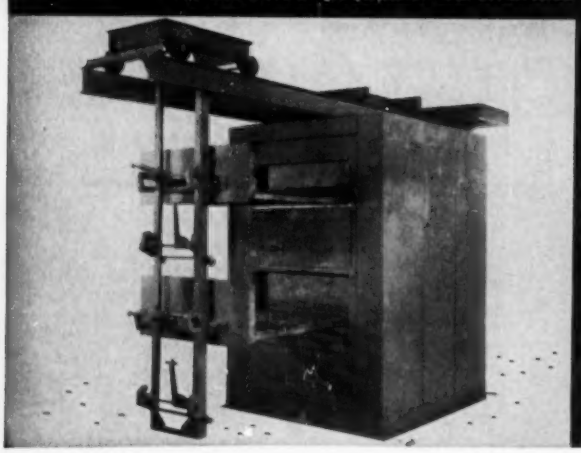




THE **carl mayer** CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories



mostat, and three individually regulated and controlled heating zones assure accurate stress rupture or creep testing.—**Tinius Olsen Testing Machine Co.**, 833 Easton Rd., Willow Grove, Pa.

For More Details Circle No. 475—Page 53

LIFT FRONT RETAINER

Lift front plate retainer of nylon plastic for welding helmets features greater infrared resistance. It is stated that the retainer has a large

plate capacity and firm plate retention. The retaining spring is readily accessible and snaps out as desired. The lift part uses coil springs to maintain a firm open position. By adjusting two screws, plate retainer can be interchanged.—**Seilstrom Mfg. Co.**, Hicks Road, Palatine, Ill.

For More Details Circle No. 476—Page 53

INDUSTRIAL MARKER

Three large-size marking devices are said to provide indelible marking on all surfaces. Model No. 133 writes on difficult surfaces and natural and synthetic compositions. This marker has stainless steel, balltype, instant valve action head on squeeze bottle container and is

available in three colors. Model No. 127 writes on smooth, nonporous surfaces. It is described as having weatherproof, sun-resistant, and abrasion-proof characteristics. No. 127 is available in eight colors. Model No. 126 is used for marking porous or nonporous surfaces, has replaceable, heavy-duty, felt-nib cube heads, and comes in 12 waterproof colors. — **Speedry Chemical Products Inc.**, P. O. Box 97, Richmond Hill, Jamaica 18, N. Y.

For More Details Circle No. 477—Page 53

CHARGE CONTROL UNIT

MP-3 charge control unit automatically controls the charging equipment for industrial truck batteries. This unit is said to require no attendance or resetting, regardless of the length of the normal charging time. A spring-pin metal stop above the control indicator facilitates presetting the unit. A control circuit also is provided to operate an external auxiliary relay when two-rate charging is used. Assembled in a gray hammertone steel case, the MP-3 can be mounted vertically on the charger or on a wall. —**Exide Industrial Div., Electric Storage Battery Co.**, Rising Sun & Adams Avenues, Philadelphia 20, Pa.

For More Details Circle No. 478—Page 53

SNOWPLOW ATTACHMENT

Snowplow attachment for Model M-15B powered wheelbarrow features correct moldboard curvature and angle for rolling snow off to the side and removable, reversible cut-

ting edge. The 50-in. blade is installed and removed easily.—**Prime-Mover Co.**, Muscatine, Iowa.

For More Details Circle No. 479—Page 53

TROLLEY SYSTEM

Penrose trolley system completely covers all live parts. The system is said to be quickly adaptable to any existing or new installation. The flexible neoprene duct features a self-closing slot through which the trolley shoe passes. The current is carried by insulated jumpers. Contact shoe is supported on an insulator on the end of the arms.—**Industrial Div., Northbrook Products Inc.**, 230 E. Ohio St., Chicago 11, Ill.

For More Details Circle No. 480—Page 53

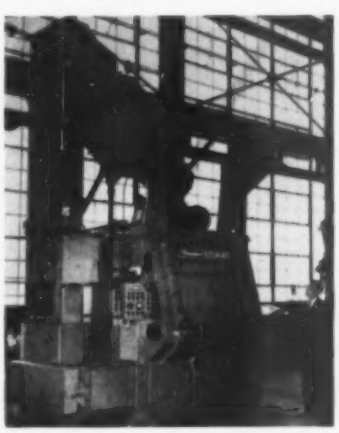
SURFACE PROTECTION

Surface protection compound, Protex, can be used with the Arcair process. An air blast will not blow it away from the surface being worked. The compound is applied to the surface with an ordinary

Heavy-Duty Barrel Cleans Large Castings

Rotoblast cleaning barrel will clean large castings weighing up to 500 lb each and will handle batch load of 2700 lb. Rugged, close-fitting, slat-type work conveyor reportedly is jamproof and quiet running. Automatic torque arm immediately disengages the shaft-mounted reducer drive in the event of a jam. Conveyor tension is adjusted from outside without dismantling or unloading. The unit incorporates a 30-hp wheel which delivers 50,000 lb of abrasive per hour.

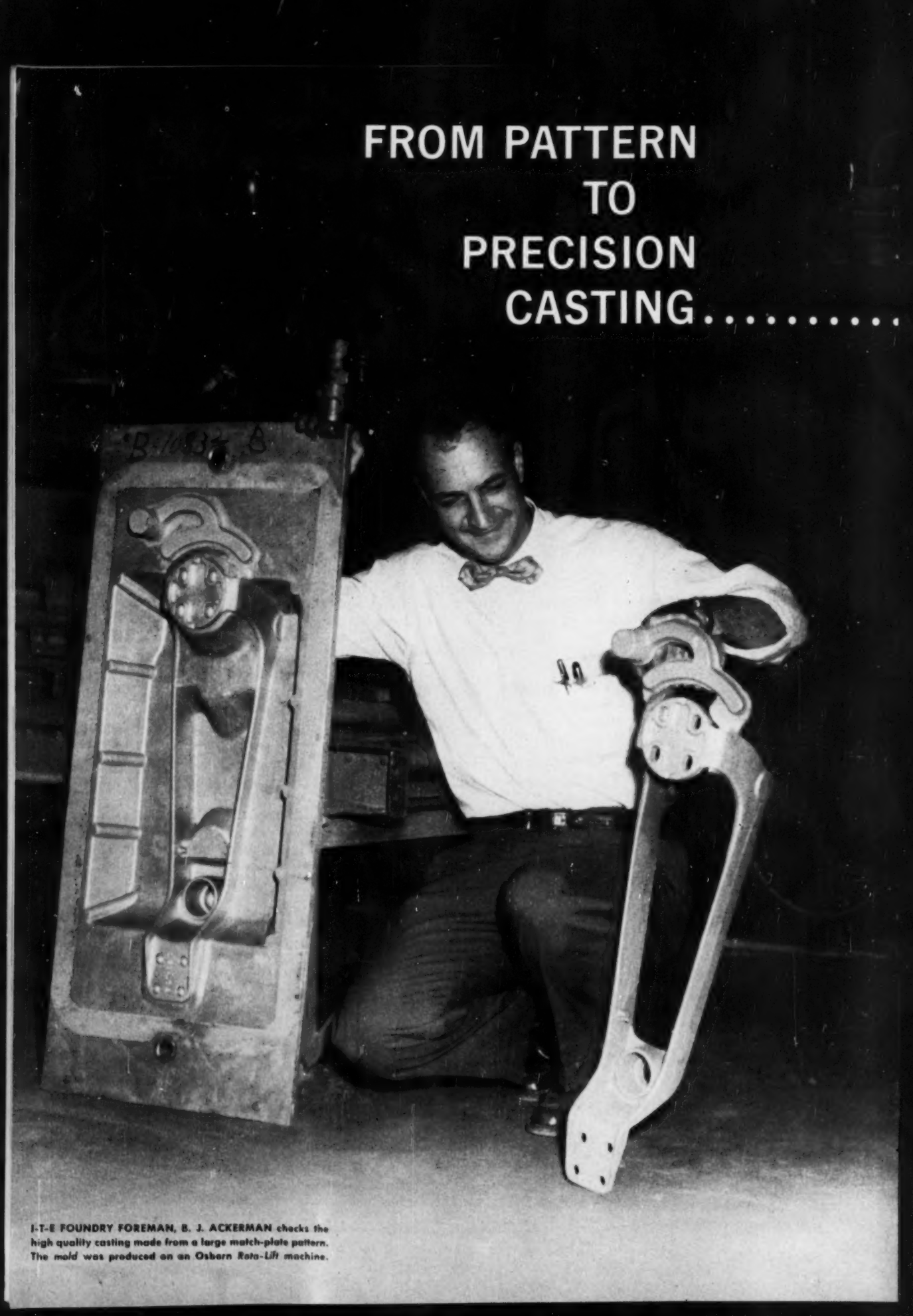
The two-piece barrel door travels on rollers in labyrinth-sealed guides which contain no gaskets or rubber seals. Door and guides are wider than the



barrel opening.—**Pangborn Corp.**, Hagerstown, Md.

For More Details Circle No. 486—Page 53

FROM PATTERN TO PRECISION CASTING.....



I-T-E FOUNDRY FOREMAN, B. J. ACKERMAN checks the high quality casting made from a large match-plate pattern. The mold was produced on an Osborn *Rota-Lift* machine.

"PERFECT MATCH"

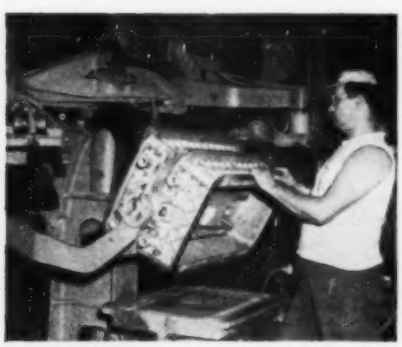
. . . and OSBORN Rota-Lift® with new match-plate handler does the molding job with more speed . . . more profit

They're proving it at I-T-E Circuit Breaker Co. where this Osborn *Rota-Lift* Molding Machine has been running a wide variety of work for over a year. The score: production and quality *up* . . . costs and operator fatigue *down* because *Rota-Lift* mechanizes all major match-plate molding operations: jolt, roll, squeeze, draw and close.

I-T-E—here at its Greensburg, Pennsylvania foundry—has been producing relatively large match-plate molds, similar to the 15″x32″–6″ drag, 7″ cope mold shown in the photo sequence below. And they found the new *Osborn match-plate handler* especially efficient on jobs involving extra-heavy pattern plates.

For any jobbing or semi-production foundry—Osborn will recommend the right model *Rota-Lift* to improve your molding operation . . . help keep your quotes competitive . . . let you handle a wider range of work . . . at a profit. Write for details. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

HOW ROTA-LIFT® MOLDING MACHINE MECHANIZES OPERATIONS AT I-T-E



DRAG HALF of mold filled and jolted . . . bottom board secured. Operator easily rolls over the mold on *Rota-Lift* rollover arms prior to filling cope and squeezing.

ROTA-LIFT MATCH-PLATE HANDLING DEVICE—shown swung out at right—has drawn pattern from drag. Cope mold is swung out at left . . . drag half of mold rests on *Rota-Lift* table. Operator now ready to return cope and close mold.

MOLD CLOSED—operator uses I-T-E's efficient chain sling setup with overhead crane and monorail system to transfer mold to pouring conveyor. Flasks are opened and removed to complete the operation.

MEMBER FEMA

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue, Cleveland 14, Ohio

OSBORN®

MOLDING MACHINES • CORE BLOWERS • METAL FINISHING MACHINES • INDUSTRIAL BRUSHES

Circle 605 on Page 53

paint brush and no waiting period is necessary for it to dry. Protex also can be used for welding, heat treating, or stress relief operations. —**Arcair Co.**, P. O. Box 431, Lancaster, Ohio.

For More Details Circle No. 481—Page 53

SONIC FILTER BAG CLEANER

Sonoclean filter bag cleaner uses sonic generators of low audible frequency. Unit cleans glass filter bags which catch dust and corrosive fumes by making them vibrate in an undulating motion without flexing. Cleaner also handles low-temperature gases.—**Fuller Co.**, subsidiary of General American Transportation Corp., Fuller Bldg., Catasauqua, Pa.

For More Details Circle No. 482—Page 53

WATER DETECTION DEVICE

Water Sentinel is an automatic monitoring device which detects presence of water in enclosed oil quench tanks used in heat treating operations. The unit consists of a detecting probe immersed in the oil and sealed in the tank.

A replaceable resistor in the heart of the sentinel, sensitive to water, changes its electrical resistance in the order of 5:1 when subjected to emulsion-moisture in excess of 0.1 per cent. This relatively great change permits safe triggering of an audible or visual alarm or an automatic shutoff device.—**Ipsen Industries Inc.**, 715 S. Main St., Rockford, Ill.

For More Details Circle No. 483—Page 53

PLASTIC-FACED PLASTER

Is New Patternmaking Tool

HIGH-STRENGTH gypsum cements known to the patternmaking industry as hard plasters or by the tradenames Hydrocal and Ultracal have become established as patternmaking and tooling mediums. Cements have been used satisfactorily for short-run or prototype tooling, but many other semiproduction applications require a material with better surface hardness. Protective coatings have not proved to be the answer to this problem, which is serious when a program cannot justify laminated or cast epoxy tooling.

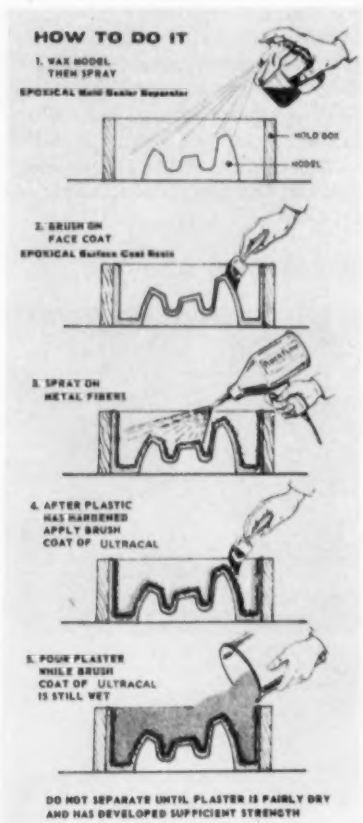
To overcome this difficulty, a new technique called the plastic-faced plaster system has been developed. It employs the economies of the hard plasters and the extreme surface hardness of epoxy plastics.

As illustrated, the process uses a new spray gun which is designed to spray metal fibers 1/16 to ¼ in. long. Copper, steel, and aluminum fibers have been found satisfactory, but aluminum fibers are recommended for economy and because of their stubby structure. On vertical walls, the lightweight, sprayed aluminum fibers will not run off or slump.

A hard, durable epoxy surface is bonded inseparably to the gypsum cast or splash by thousands of the metal fibers, sprayed into a wet plastic surface coat or laminating resin with the spray gun. This technique provides a metal fiber and plastic facing which is hard, tough, dense, and durable and gives longer life to the plasters.

Extensive tests now are being conducted to use this approach to build up a ¼ to ½-in. laminate with metal fibers. Where conductivity or heat transfer is required, the metal fiber, epoxy resin laminated structure shows great promise as a conductive epoxy laminate. — **U. S. Gypsum Co.**, 300 W. Adams St., Chicago 6, Ill.

For More Details Circle No. 487—Page 53


HOW TO DO IT
1. WAX MODEL THEN SPRAY
EPOXICAL Mold Sealer Separator
HOLD BOX
MODEL
2. BRUSH ON FACE COAT
EPOXICAL Surface Coat Resin
3. SPRAY ON METAL FIBERS
4. AFTER PLASTIC HAS HARDENED APPLY BRUSH COAT OF ULTRACAL
5. POUR PLASTER WHILE BRUSH COAT OF ULTRACAL IS STILL WET
DO NOT SEPARATE UNTIL PLASTER IS FAIRLY DRY AND HAS DEVELOPED SUFFICIENT STRENGTH

Drawings indicate successive steps which are followed in the production of plastic-faced patterns for short-run or prototype work

Illustration shows typical core stick applications and short-run foundry patterns which were made by the plastic-faced plaster technique

Circle 606 on Page 53→

HOLLYWOOD HAS

Brigitte Bardot . . .

Labor has Hoffa. Dodgers have the pennant. The Republicans have Nixon and the Democrats have Kennedy . . . but, only a foundryman can have Handlebar Harry: In fact, *YOU* may have Handlebar Harry!

If you do, you have the oldest Simpson Mixer still in foundry operation, and it may win you a trip to Hawaii. But remember . . .

Any Mix-Muller can win a prize

All Mix-Muller users are eligible for a prize no matter how new the machine.

This $5000 contest search marks the inauguration of National's Mix-Muller Retirement Plan—a program designed to make it easier and more economical for Mix-Muller users to meet the production challenge of the 60's with a modern, high production F Series Mix-Muller.

Why not return your entry today? Entry blank, rules and full contest details are attached.

See **the next page for prizes and rules**

HANDLEBAR HARRY CONTEST

OFFICIAL ENTRY BLANK

Be sure to fill in the 50-word statement below.

1. I have read and agree to the contest rules. Here is my entry. The serial number of our *Handlebar Harry is* _____.
(If more than one mixer, enter oldest number only.) If no record of serial number, contact your National Agent.

2. This Simpson Mixer is in regular operation in our foundry and has been the property of our company for ____ years.

Your Name _____

Your Company _____

Address _____

City _____ Zone ____ State _____

Entry must be postmarked no later than midnight, February 28, 1960.

50-Word Statement

In 50 words or less, tell how this Simpson Mix-Muller has contributed to the success of your foundry operation: Example: **This Mix-Muller has served our foundry daily for _____ years without downtime for repairs. In that time, it has prepared _____ tons of sand.**

(type or print below . . . or attach a separate sheet)

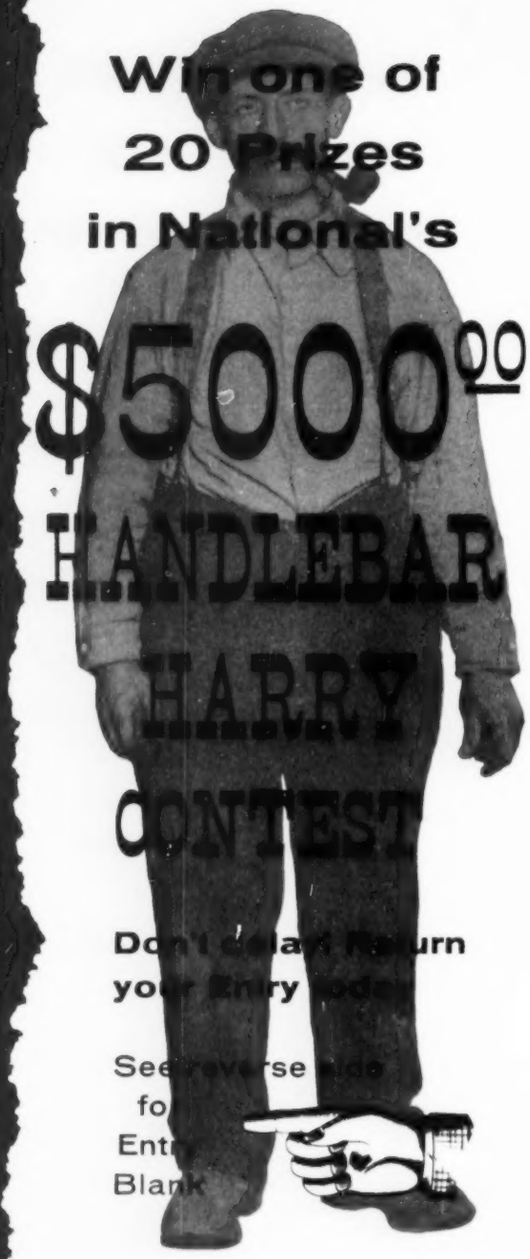
F

DM

TEAR OFF and return to:

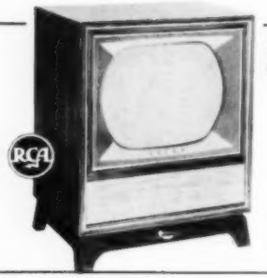
HANDLEBAR HARRY
National Engineering Co.,
Machinery Hall, Chicago 6, Illinois

HANDLEBAR HARRY CONTEST



FIRST GRAND PRIZE
(for Handlebar Harry)

Trip to Hawaii for two via American Airlines 707 Jet to Los Angeles and Pan American Clipper to Honolulu. Ten dream days with expenses paid at the luxurious Hawaiian Village Hotel. Side trips of your choice.



3 SECOND PRIZES
(Two for Harry No. 2 and 3; one for best 50-word statement)

RCA "Latham" color console model TV sets in your choice of three wood finishes.

4 THIRD PRIZES
(Two for Harry No. 4 and 5; two for next best 50-word statements)

RCA "Fairfield" black and white console TV sets in Blond or Walnut.

CONTEST RULES

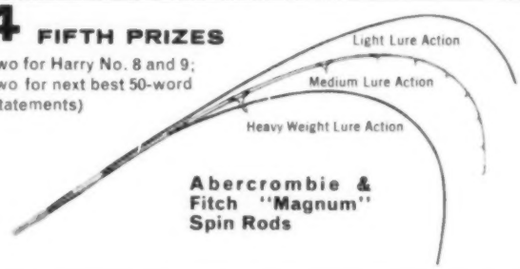
Any Simpson Mix-Muller can be entered, as long as entry is accompanied by 50-word statement.

1. Only foundrymen, persons who work for or in a foundry operation are eligible to enter
2. Serial number of the machine must accompany your entry If nameplate is missing, contact National for help.
3. Your **Handlebar Harry** must be in weekly **foundry** usage and have been the property of your company for over one year.
4. More than one entry from a company will be accepted but only one prize will be awarded to any one company.
5. Ties will be settled upon basis of, in opinion of judges, originality and sincerity of thought expressed in 50-word statement. Judges have been appointed by the AFS.
6. All entries must be accompanied by 50-word statement. No entries will be returned and all become the property of National Engineering Company.
7. No cash prizes will be awarded in lieu of trip or merchandise. In event first prize winner cannot take trip, it is expected that winner company will assign a substitute.
8. Contest is limited to residents of the United States and Canada. It is subject to all federal, state and local regulations. Any federal, state or other tax imposed on prize will be sole responsibility of the prize winner.
9. All entries must be postmarked no later than midnight, February 28, 1960. Winners will be announced at the AFS Convention in Philadelphia in May, 1960.

4 FOURTH PRIZES
(Two for Harry No. 6 and 7; two for next best 50-word statements)

Remington "Sportsman 58" Autoloading Shotguns.

4 FIFTH PRIZES
(Two for Harry No. 8 and 9; two for next best 50-word statements)



Abercrombie & Fitch "Magnum" Spin Rods

4 SIXTH PRIZES
(Two for Harry No. 10 and 11; two for next best 50-word statements)

Abercrombie & Fitch "Monogram" 200-six Spin Reels.

DON'T DELAY – RETURN YOUR ENTRY TODAY!

NATIONAL ENGINEERING COMPANY
600 Machinery Hall • Chicago 6, Illinois

Record Attendance Marks

NON-FERROUS FOUNDERS' MEETING

By WILLIAM G. GUDE
Managing Editor

● DISCUSSION of costs, selling, and labor problems occupied the principal attention of nonferrous foundry management at the recent annual meeting of the Non-Ferrous Founders' Society.

The meeting, held at the Bedford Springs Hotel, Bedford, Pa., Oct. 22-24, had an attendance of 151 persons from 53 companies, the largest gathering in the society's history.

New Officers—In the annual election of officers, M. E. Nevins, president, Wisconsin Centrifugal Foundry Co., Waukesha, Wis., was named president to succeed Philip E. Lankford, East Birmingham Bronze Foundry Co., Birmingham, Ala. Other officers elected are Elmer G. Brumund Jr., vice president, Brumund Foundry Co., Chicago, first vice president; Dan A. Mitchell, vice president, Progressive Brass Mfg. Co., Tulsa, Okla., second vice president; and Herbert F. Scobie, secretary-treasurer.

Directors elected for three years are R. E. Dickison, vice president, Brass Foundry Co., Peoria, Ill.; L. J. Andres, president, Lawran Foundry Co., Milwaukee; W. O. Larson, president, Grafton Foundry Co., Grafton, Ohio; N. W. Meloon, president, Meloon Bronze Foundry Inc., Syracuse, N. Y., and J. J. Markowich, Northern Cast Alloy Inc., Van Dyke, Mich. Robert Langsenkamp, president, Langsenkamp-Wheeler Brass Works Inc., Indianapolis, and chairman of the Annual Meeting Committee, was re-

M. E. NEVINS
President

ELMER G. BRUMUND JR.
First Vice President

DAN A. MITCHELL
Second Vice President

William A. Gluntz Sr., left, a past president of the Non-Ferrous Founders' Society, receives the Distinguished Service Award from Robert Langsenkamp

elected to be a director at large.

Service Award — Featuring the annual banquet was the society's first presentation of its Distinguished Service Award. An attractive plaque, it went to William A. Gluntz Sr., secretary-treasurer, Gluntz Brass & Aluminum Foundry Co., Cleveland. Mr. Gluntz is a past president of the society and has been active in its work, particularly in matters relating to costs, since the organization was formed. The award was made by the Awards Committee chairman, Robert Langsenkamp.

The society intends to continue its three-prong attack toward its objective of increased sales of nonferrous castings, it was stated by P. E. Lankford, president, in his annual report. Activities are being concentrated in the fields of marketing, costs, and technical matters, and work of the recently formed Marketing Committee has been integrated with that of the Cost and Technical Committees.

New aims are the development of more statistical data on both producers and consumers of castings, and more intensive public relations. Membership in the society, he stated, now totals 300 foundries.

Foundry Labor Problems—The recent recession pointed up problems in foundry labor agreements that did not exist in the recessions of 1954 and 1949, said C. T. Sheehan, executive secretary, National Foundry Association, Chicago. The main difficulty has existed in seniority provisions in contracts. These clauses, Mr. Sheehan said, must be tailored to suit the individual plant, and should take into consideration skill and ability, not seniority alone. Use of incentive systems in foundries is growing, and is being viewed with more favor by unions. At the same time, it should be the company's prerogative to select the method on which incentive payments are based, provided, of course, that it is equitable.

Other problems which developed within the last year were related to limitations in cutting the work week, rights of laid-off workers to certain fringe benefits, apprenticeships, and increased mechanization of plants.

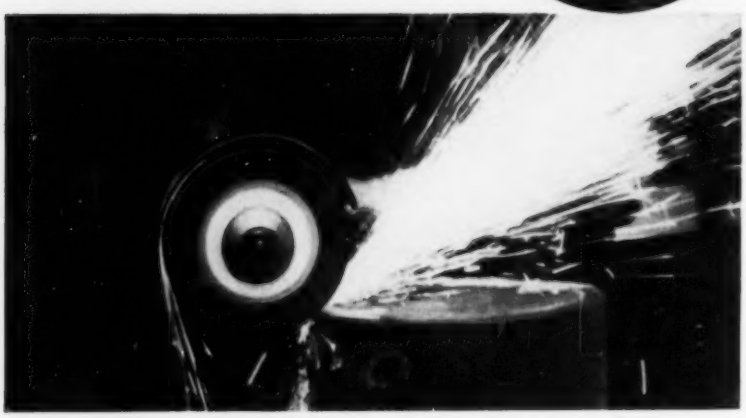
Financial Management—A panel for the discussion of financial management subjects was presided over by L. J. Andres, Lawran Foundry, Milwaukee. Speaking on pitfalls in job quotations, George T. Fischer, Fischer Casting Co., Dunellen, N. J., recommended that the foundry be familiar with these factors: Qualifications of the plant to handle specific jobs; knowledge of the quality of patterns used; accurate estimates of melting costs and metal yield; and requirements of molding and coremaking.

He suggested checking procedures in handling former similar jobs, the search for improvements in molding methods to minimize cost, study to determine if machining can do some of the work usually handled by the cleaning room, and a check on the administrative cost of handling subcontract operations.

Rising trends in foundry costs were traced by William A. Gluntz Sr. He pointed out that the share of total cost represented by wages has risen markedly since 1952. In the case of one company, wages

ATLANTIC WHEELS

cut work fatigue to a man-saving minimum!



Ask the men who use them — Atlantic Grinding Wheels have a smooth, floating action that requires less grinding pressure, keeps operators fresher for longer periods throughout the daily work schedule. Even where metal removal is roughest, you can count on Atlantic Wheels for fast, cool, clean-cutting performance . . . depend on their rugged resinoid bond for maximum on-the-job safety.

A trial run in your plant will quickly prove their worth in money-saving terms. Have an Atlantic representative recommend the right wheel for your specific requirements. Meanwhile, write for your free copy of the Atlantic Grinding Wheel Catalog. Atlantic Abrasive Corp., 534 Pearl Street, South Braintree, Massachusetts.

Atlantic Abrasive Corp.

A DIVISION OF ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts

STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

Circle 607 on Page 53

represented 35 per cent of total sales but today the proportion is 47 per cent. Prices of copper-base alloys have fluctuated rather widely, while aluminum alloys have been relatively steady during this period. New production methods offer one opportunity for absorbing some of these higher costs. Mr. Gluntz also recommended increased group activity in cost comparison work.

Use of various ratios developed from a company's balance sheet and income statements was explained by John E. Graf, Mansfield Brass & Aluminum Corp., Mansfield, Ohio. These ratios can be used to determine not only the company's present status, but also can serve as a warning of possible trouble ahead. They can be developed quickly from financial statements and, once obtained, are relatively easy to interpret.

Various sources of information are available for credit ratings of consumers, it was stated by Chester K. Faunt, Faunt Foundry Co., Chicago. He recommended checking more than one source. Special lists in which companies interchange information on credit are especially useful, and he suggested the setting up of such a list for use by nonferrous foundries.

How To Sell—A panel session devoted to selling methods was presided over by R. E. Dickinson, Brass Foundry Co., East Peoria, Ill. A discussion of advertising practice by Charles H. Stokesbury, Derby Castings Co., Seymour, Conn., was presented by William L. Leopold, Northern Bronze Corp., Philadelphia.

Use of direct mail, catalogs, and literature was related by Dan A. Mitchell, Progressive Brass Mfg. Co., Tulsa, Okla. Such materials, he said, should attempt to develop and sell the personality of its sponsor.

Mr. Dickinson gave a report on use of novelties, seasonal gifts, and entertainment that was prepared by John W. Horner Jr., Slack-Horner Brass Mfg. Co., Longmont, Colo. It pointed to the trend away from giving expensive gifts and showed how inexpensive novelties often prove effective.

Advantages and disadvantages of use of sales representatives rather than direct salesmen were cited by Roy W. Braid, National Aluminum Co. Inc., Racine, Wis. Subsequent discussion indicated that sales representatives do a better job for small companies than do direct salesmen, especially on a national basis. This, however, is not true in concentrated areas. On the other hand, purchasing agents frequently prefer to deal with direct salesmen rather than with representatives.

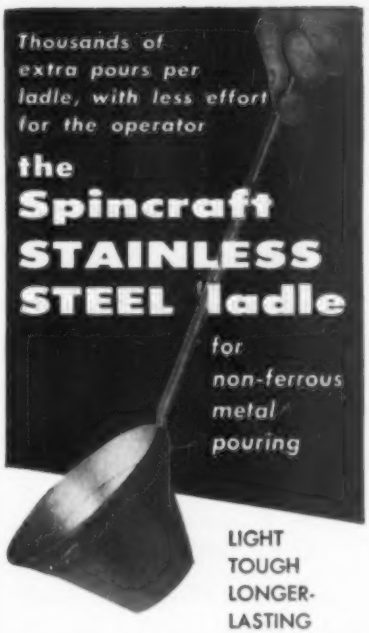
Robert Langsenkamp, Langsenkamp-Wheeler Brass Works Inc., described his company's experience in conducting an exhibit at a state purchasing agents' meeting and listed the requirements for an effective display, its cost, and results obtained.

Competitive Advantages — More and better organized research and development effort is needed for the foundry industry to maintain and improve its competitive position. This warning was made by Dr. R. A. Flinn, University of Michigan, at the meeting's last session. The purchasing agent's choice of a product is based on quality, service, and price, he said, and although foundries recognize this fact, the industry has not publicized sufficiently the basic engineering factors which give castings a competitive advantage in these fields.

At the opening day's luncheon, Col. J. J. Sustar, Pittsburgh, discussed trends in foreign competition. The principal banquet speaker was Dr. Richard C. Bates, Lansing, Mich., who gave a factual and entertaining talk on "How To Have a Heart Attack."

CBBI Meeting—The Cast Bronze Bearing Institute, a product group of NFFS, held its annual meeting on Oct. 21. Discussion was concerned mainly with current and proposed research, development, and promotion activities. The institute recently completed preparation of a manual on design and application of cast bronze bearings.

These new officers were elected: President, William H. Crossman, assistant secretary-treasurer, Randall Graphite Bearings Inc., Lima, Ohio, succeeding G. F. Langford, president, Superior Kendrick Bearings Inc., Detroit; vice president, Carter N. Paden Jr., secretary, Moccasin Bushing Co., Chattanooga, Tenn.; secretary-treasurer, A. G. Eberle, general superintendent, Renewal Service Inc., Philadelphia.


Thousands of extra pours per ladle, with less effort for the operator
the Spincraft STAINLESS STEEL ladle
for non-ferrous metal pouring
LIGHT
TOUGH
LONGER-LASTING

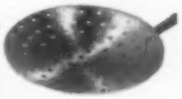
If you pour non-ferrous alloys, Spincraft ladles will save you replacement costs and make the job much easier. Designed to reduce operator fatigue by their lightness, balance, and non-spill shape, they resist burning-through as only stainless steel with its high critical melting point can do. Spincraft ladles come in 23 sizes, from ¼ lb. to 30 lb. molten metal capacity.

- 75% lighter than cast iron ladles
- Amazingly long life
- Shot-blasted for coating adhesion
- Deep conical form makes pouring easier, minimizes spillage
- Can be used for zinc and other metals without coating
- "Whack proof" handle arc-welded to reinforced cup edge
- Built to last longer, work lighter. Let your operator use one, then try to take it away from him!

Complete handle on ¼ lb. through 9 lb. size; 10 through 30 lb. size has handle bracket stub to which proper length handle can be attached.

Also...Spincraft STAINLESS STEEL Skimmer

A skimmer that really skims! Shallow radius skims surface impurities instead of ladling as deeper-cupped skimmers do. Correct size holes prevent clogging. Short handle stubs fit common pipe and permit attachment of length and type handle you want.



IN FOUR DIAMETERS: 6 inch, 8 inch, 10 inch, 12 inch.

Spincraft ladles and skimmers are also available in low-cost mild steel.

Spincraft — SKILL WILL DO IT

Write for complete data and prices today.

SPINCRAFT, INC.
4124 West State St., Milwaukee, Wis.

Send us complete information on:

Stainless Steel	Mild Steel
☐ Ladles	☐ Ladles
☐ Skimmers	☐ Skimmers

Company .....

Address .....

City ..... State .....

Name .....

Circle 608 on Page 53

Industry Briefs

Perfect Circle Corp., Hagerstown, Ind., has purchased 80 acres of land near Rushville, Ind., for construction of a $3 million piston ring foundry. The 80,000-sq-ft building is to be completed late next year and will employ 150 to 200 people when in full operation. The new plant will have three times as much capacity as the Rushville foundry it will replace.

Kaiser Refractories & Chemicals Div., Kaiser Aluminum & Chemical Corp., Oakland, Calif., has moved its regional sales office at Hammond, Ind., to Mexico, Mo., and combined it with the Central Div. sales office there.

General Mills Inc., Minneapolis, has acquired the business and assets of Magnaflux Corp., Chicago, which it will operate as a wholly owned subsidiary. Magnaflux will continue in business under the same name at its present location in Chicago. R. A. Wilson, General Mills vice president and general manager of its Mechanical Div., becomes president of Magnaflux, replacing F. B. Doane, who is retiring as president and board chairman. Other key officers and personnel of the Chicago corporation will retain their positions.

Haynes Stellite Co., division of Union Carbide Corp., New York, now is producing investment castings of Armco Steel Corp.'s 17-4PH stainless steel, under terms of a recently negotiated licensing agreement.

Eutectic Welding Alloys Corp., Flushing, N. Y., has opened a new warehouse-service center at 4353 S. Kedzie Ave., Chicago, Ill., under the name Eutectic Welding Alloys —Central Div. Inc. Les Soliday is manager.

Yale Materials Handling Div., Yale & Towne Mfg. Co., Philadelphia, has appointed Belmont Equipment Co., 315 E. Illinois St., Evansville, Ind., as sales and service representative for its lift trucks and tractor shovels in southwest Indiana, southeast Illinois, and western Kentucky. Clyde F. Gaisser is president of the recently formed Belmont company.

Cooper-Bessemer Corp., Mt. Vernon, Ohio, has appointed C. C. Moore & Co., San Francisco, to handle sale and application of its industrial air compressors and soot blowers in the West Coast area. H. H. Smith is president of C. C. Moore & Co.

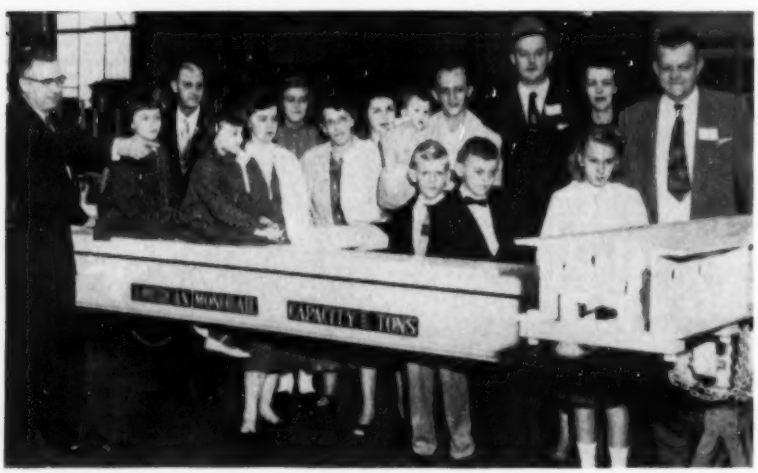
General Foods Corp., White Plains, N. Y., has appointed E. S. Atkinson Co., Erie, Pa., as foundry representative for its Post Div., Kankakee, Ill., to cover distribution of core binders in the Erie area. Robert F. Painter is president of the Atkinson company.

Allis-Chalmers Mfg. Co., Milwaukee, has embarked on a foundry modernization program at its plant in West Allis, Wis., which is scaled to meet current and future production needs. The project will involve the transfer of operations and equipment at No. 2 foundry to No. 1 foundry. The largest expenditure for new equipment is for automatic molding and for changes in the conveyor system, cooling, and sand handling. Work is scheduled to start about Feb. 1 and to be completed late in 1960.

Frederic B. Stevens Inc., a subsidiary of Udylite Corp., Detroit, has moved its Indianapolis facilities to a new, larger warehouse and office at 5345 Lexington Ave. Personnel is unchanged.

Western Foundry Co., Tyler, Texas, has been sold to Woodward Iron Co., Woodward, Ala. The sale price was $2.5 million. Work was scheduled to be resumed at the plant Nov. 9.

Industrial Heating Equipment Association reports net new orders for industrial heating equipment through September totaled $72,484,000, or 131 per cent ahead of the



ON THE MOVE: American MonoRail Co. has moved to a new plant and offices, tailored to fit its needs, at 1111 E. 200th St., Euclid 17, Ohio. The plant contains 130,000 sq ft on 7½ acres and represents an investment of more than $800,000. A series of openhouses and special tours by community and industry groups and families of employees preceded the official opening. Shown on tour is the family of Joseph Hallman, guided by Carl Harris (far left), vice president in charge of production. Four of the Hallmans are AM employees

LOW COST MECHANIZED SAND HANDLING

WITH HANDY SANDYS SAVE ON CAPITAL INVESTMENT

*PATENTED

Handy Sandy, the individual-floor, sand handling unit, has been accepted throughout the foundry industry as the most economical method for furnishing overhead sand at low cost to molding stations. Handy Sandy offers further economies in that it takes a low capital expenditure to progressively mechanize any foundry. In most cases, one installation has led to several within a foundry, and today there are well over one thousand Handy Sandys proving their value in foundries everywhere.

and, only Handy Sandy offers all of these features:

- BUILT-IN AERATOR
- AUTOMATIC HOPPER LEVEL CONTROL*
- SAND VOLUME EQUALIZER
- DRIBBLE GATES*
- AUTOMATIC FEED VOLUME CONTROL*
- LOWER SAND STORAGE HOPPER WITH ENDLESS BELT FEEDER
- AUTOMATIC ELEVATOR TAKEUPS
- LESS HEADROOM
- INSTALLATION FLEXIBILITY
- MANY STANDARD MODELS

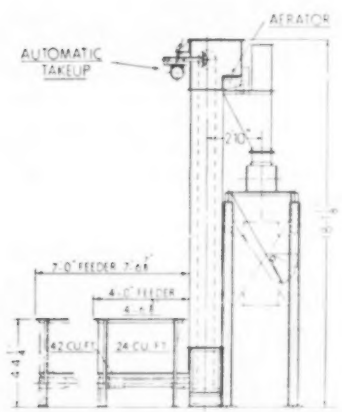
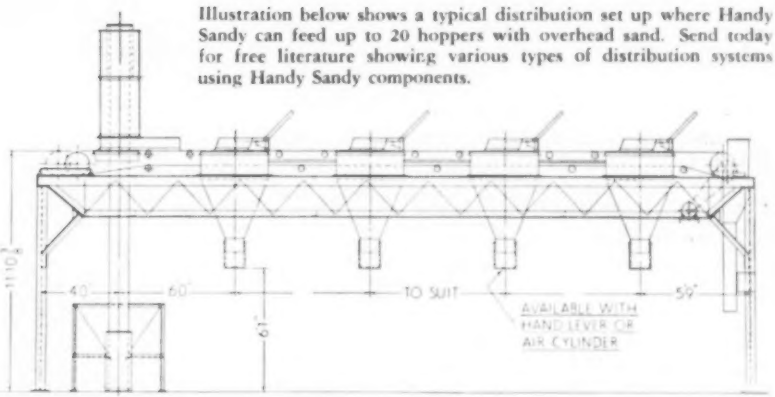


Illustration below shows a typical distribution set up where Handy Sandy can feed up to 20 hoppers with overhead sand. Send today for free literature showing various types of distribution systems using Handy Sandy components.



NEWAYGO engineering company
NEWAYGO, MICHIGAN

Send for our new 16 mm sound film featuring Progressive Mechanization in 9 foundries. Use of film is free.

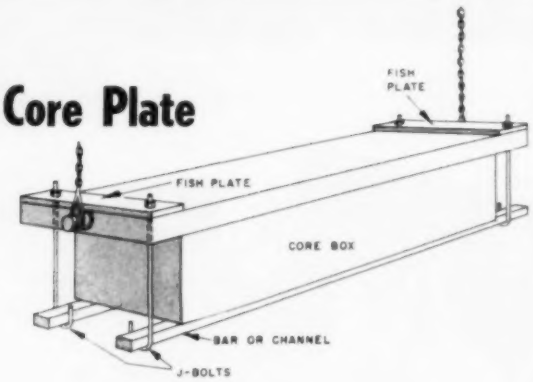
Circle 609 on Page 53

HOW To Do It

FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published

When To Use a Green Sand Core Plate

By L. H. AKERMAN
Foundry Foreman
Kent Alloys Co.
Rochester, Kent, England



JOBBING FOUNDRIES occasionally find it necessary to make a large core for which no core plate is available. The following method, which has proved satisfactory in our operation, is suggested.

Locate a well-braced cope from 4 to 6 in. deep and slightly larger than the corebox to be used. Ram it up with green sand, strike off, and vent well with a rod or wire. Apply a liberal amount of parting compound.

This green sand "core plate" then is lifted by crane, turned over and set on the rammed corebox. The flask is clamped to the corebox by any convenient means. As illustrated here, clamping is by fish plates, J-bolts, and bars.

The assembly then is rolled over, set on the baking oven car and unclamped. The box is drawn off the core, which is touched up if necessary and made ready for baking. Drying time is lengthened a little to allow for drying of the green sand "core plate."

1958 period. Induction heating equipment orders totaled $11,993,000, a 156 per cent gain over last year.

Hooker Chemical Corp., Niagara Falls, N. Y., has established a new Buffalo district sales office at 120 Delaware Ave., to be occupied jointly by its Eastern Chemical Div. and Durez Plastics Div. Charles H. Foster Jr. has been appointed manager for Eastern Chemical, and Harry M. Dent Jr. continues in a similar post for Durez, in the Buffalo sales district.

Planet Corp., Lansing, Mich., has appointed Benedict & Boggs Co., Birmingham, to be its sales representative in the Alabama area. Earl A. N. Johnson of Edmonds, Wash., will represent Planet in Washington, Oregon, northern Idaho, and British Columbia.

Harbison-Carborundum Corp. has been formed by Harbison-Walker Refractories Co., Pittsburgh, and Carborundum Co., Niagara Falls. The jointly owned subsidiary, established for the engineering, manufacture, and sale of fused refractories, will own and operate Carborundum's recently modernized and expanded plant in Falconer, N. Y. Additional new facilities are contemplated for the manufacture of chromite magnesia-base fused refractories at a location not yet announced.

Meehanite Metal Corp., New Rochelle, N. Y., has been purchased by Harry H. Kessler & Associates, St. Louis. No change in location or method of operation is planned, and Meehanite will continue to operate as a separate company. Harry H. Kessler will become president of the company, and Oliver Smalley, former president, will remain with Meehanite as advisor.

Prenco Products Inc. and **Prenco Mfg. Corp.** have moved from Hazel Park, Mich., to new and enlarged quarters at 2605 W. 14 Mile Rd., Royal Oak, Mich. The new 7000-sq-ft plant provides added space for engineering, production, and contract impregnation service operations.

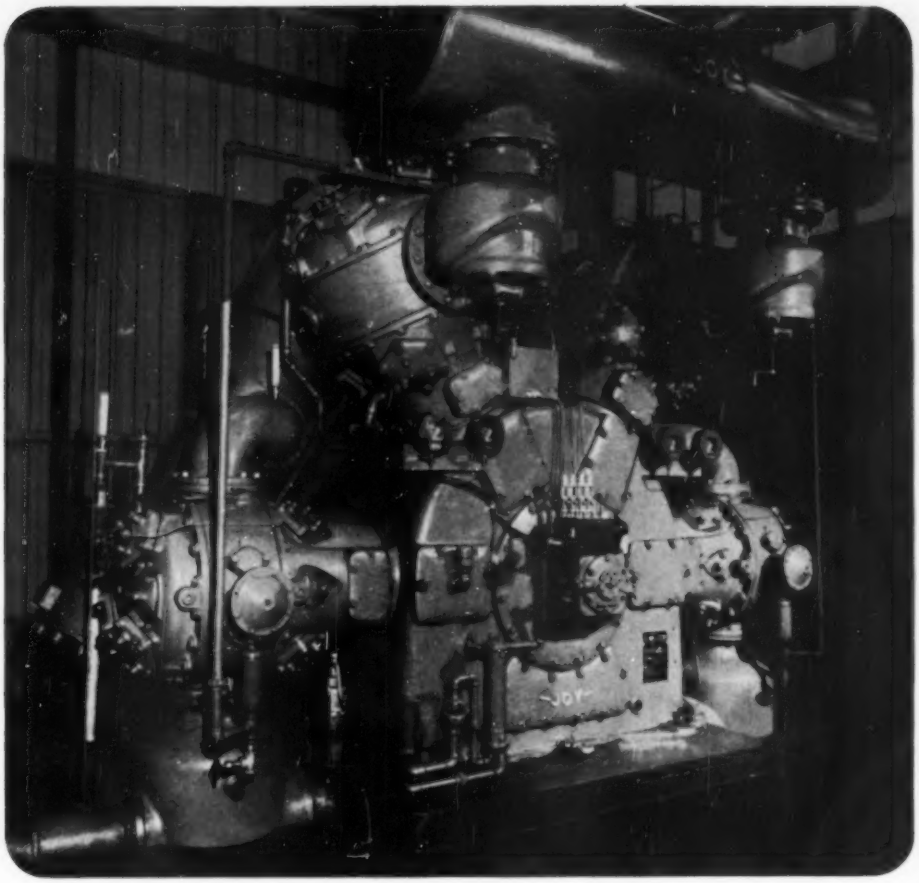
Textile Machine Works, Reading, Pa., is installing new automatic spraying and baking equipment to porcelainize cast iron cookware produced by its recently purchased Prizer-Ware Div. Castings will be manufactured at the Textile Machine Works foundry. Samuel O'Connell has been appointed general sales manager of the Prizer-Ware Div.

Sealed Power Corp., Muskegon, Mich., has announced a $400,000 foundry expansion program. Semi-precision plate, large ring, and miscellaneous casting capacity will be more than tripled by the expansion. Manufacturing operations are scheduled to start next spring.

Union Carbide Metals Co., division of Union Carbide Corp., New York, plans to reactivate an existing submerged-arc electric smelting furnace at its Sheffield, Ala., plant and to convert it to calcium carbide production.

E. W. Bliss Co., Canton, Ohio, has sold its Toledo, Ohio, foundry to Baron Steel Co., Toledo. The gray iron foundry contains 80,000 sq ft of floor space. Plans for future use of the foundry are not complete.

WaiMet Alloys Co., formerly of 1999 Guoin St., Detroit, plans to move about the middle of December to 5320 Oakman Blvd., Dearborn, Mich.



This WN-224 Compressor supplies plant air to a modern foundry in Indiana.

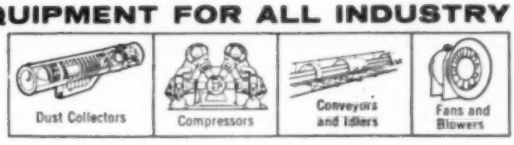
Joy Design Means:

SIMPLE BASE WHICH CUTS COMPRESSOR INSTALLATION COSTS

The semi-radial design of Joy compressors makes installation a simple and inexpensive operation. Machines are completely assembled when shipped from the factory. Installation is accomplished by securing the frame to four studs set in the rectangular concrete pad. Form work is simpler, and the complicated alignment and assembly operations necessary with other compressors are eliminated. The net result is lower installation cost for your compressors.

Joy semi-radial compressors have many other features which enable them to supply plant air at minimum cost by reducing operating and maintenance expense. Your Joy representative can supply complete details, or write for Bulletin 925-13.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



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Circle 610 on Page 53

Agustin Plana, congress president, standing left, opens the International Congress

Madrid Is Site of 26th

International Foundry Congress

By M. M. HALLETT
Managing Director
Chamberlin & Hill Ltd., Walsall, England
European Editor, Foundry

● HIGH LIGHTS of the 26th International Foundry Congress included election of the Russian Foundry Association to membership in the International Committee of Foundry Technical Associations and a reorganization of the secretariat of the International Committee. The congress was held Oct. 5-11 in Madrid, Spain.

At the opening ceremony, Agustin Plana, conference president, welcomed the delegates. The meeting also was addressed by J. Planel, minister of industry, and by Dr. A. Dacco, of Italy, president of the International Committee of Foundry Technical Associations. It was announced that the new vice president of the International Committee will be F. W. E. Spies (Holland), who will be in office for the 1960 meeting in Zurich, Switzerland. The Award of Honor of the International Committee (donated by M. Olivo) was presented to Mr. Plana.

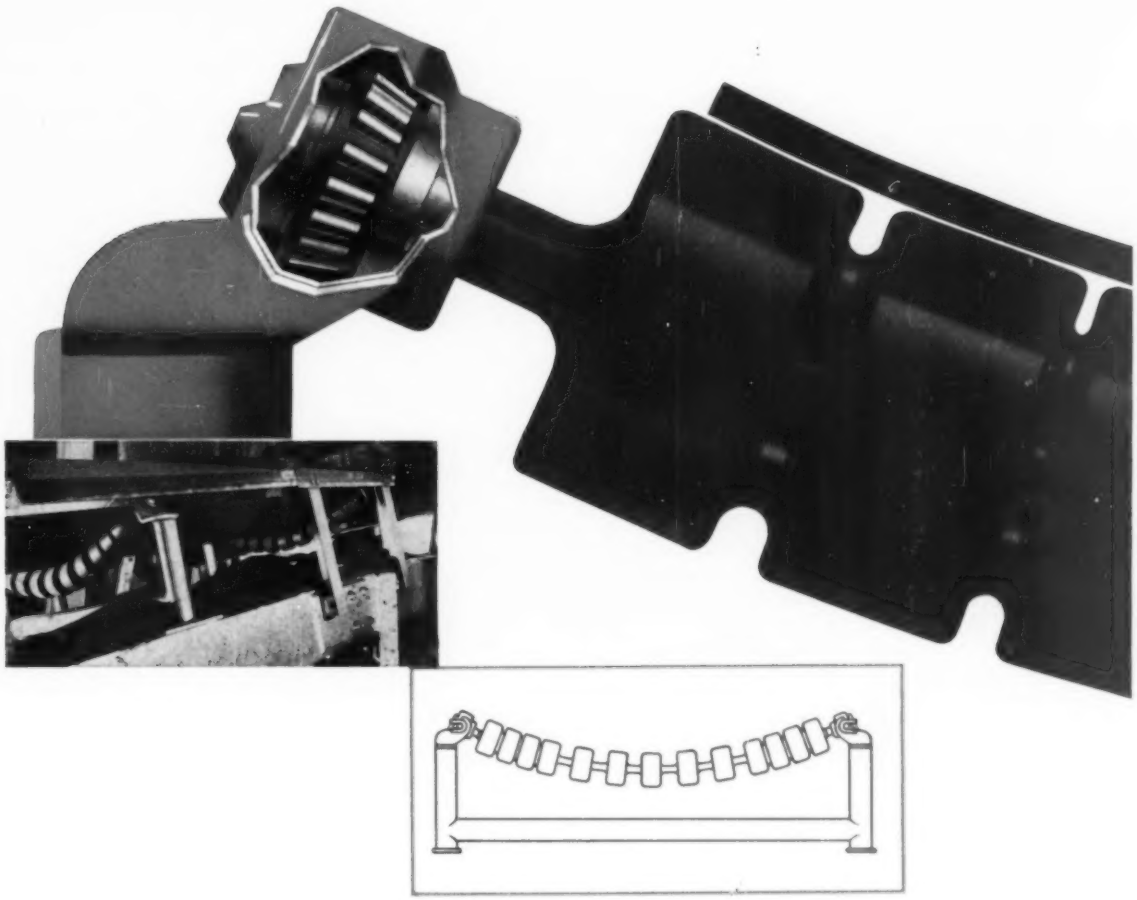
Russians Become Members—At the meeting of the International Committee, the Russian Foundry Association was elected to membership. A major change also was effected in the secretariat. George Lambert (England) had been forced to resign because of the pressure of his work for the Institute of British Foundrymen, which previously had provided the service free of charge. It was decided to introduce an independent secretariat, the choice for which fell on Dr. Muller of Switzerland. This change will involve heavier financial contributions from member countries.

Progress of Subcommittees—The various subcommittees are progressing satisfactorily, it was reported. The International Foundry Dictionary Committee made substantial progress during the year in response to the urging of its chairman, Mr. Olivo. The Testing of Cast Iron Committee was active, particularly on impact testing of cast iron and on the issue of an extended system

Dr. A. DACCO
President, International Committee

F. W. E. SPIES
Vice President, International Committee

Bearing Location is the Key to Long Service Life



JOY LIMBEROLLER® CONVEYOR IDLERS

Joy Limberoller Conveyor Idlers give many times the normal service life, because the two bearings rest in slots in the support brackets—well away from spillage. On conveyor lines carrying ore, limestone, and other abrasive materials, Limberollers have given more than ten times the service life of steel idlers.

Limberoller Idlers consist of a neoprene coated wire rope to which are moulded neoprene discs. The ends of the rope turn in sealed bearings. This design not only eliminates clogging and freezing of the bearings, but also makes the idlers easy to service—they can be replaced while the belt is moving.

Limberollers are economical, not only because of long service life, but also because they can be spaced further apart than steel idlers. They are corrosion and flame resistant, self-cleaning, and eliminate the "bump" typical of steel idlers.

For complete details, write for Bulletin 963-13.

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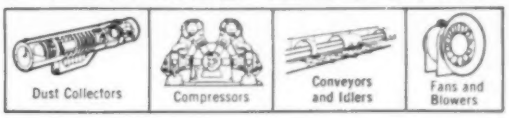
EQUIPMENT FOR ALL INDUSTRY



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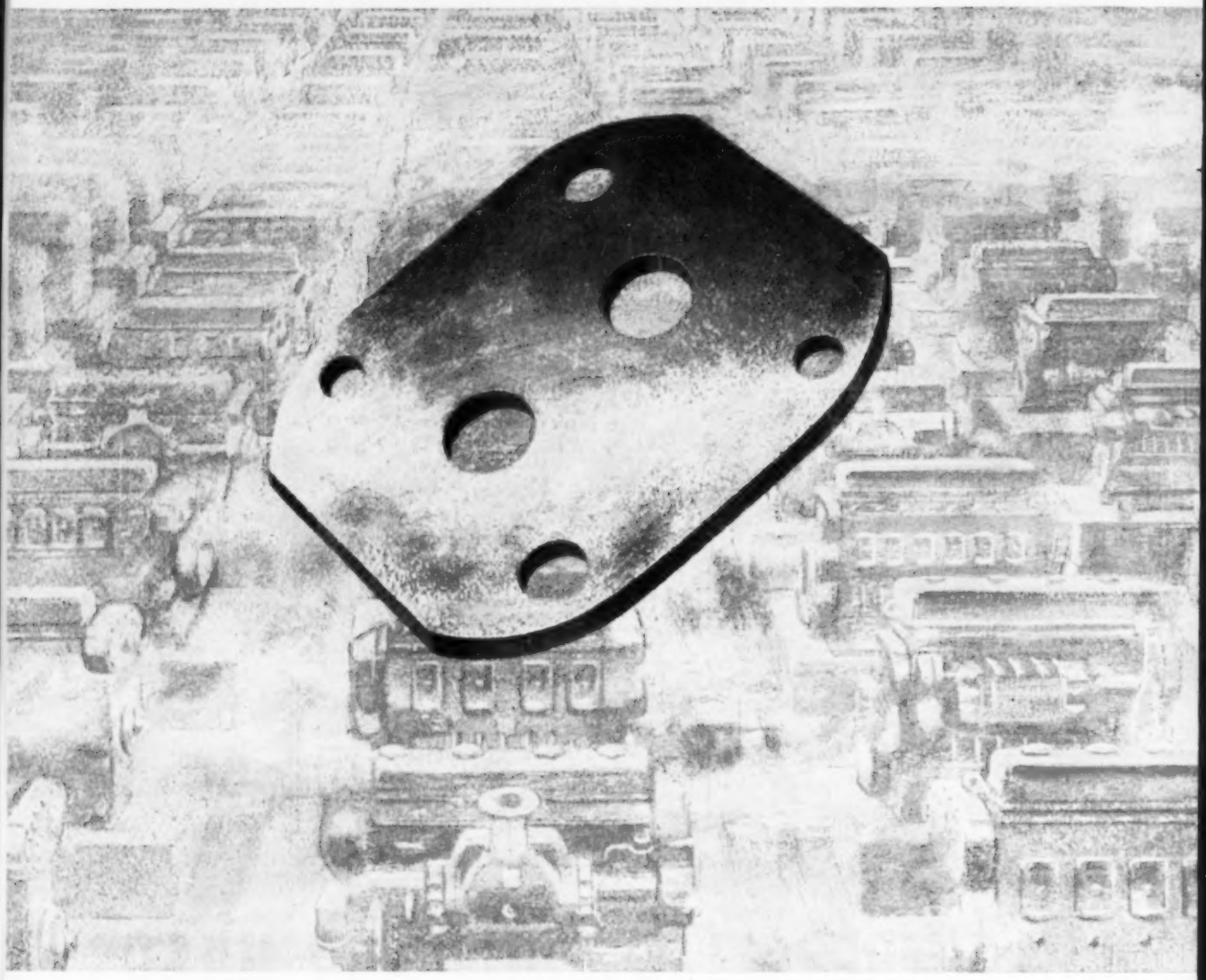
Circle 611 on Page 53

How the Foundry Industry Serves America . . . #3 of a Series



88% COST SAVINGS EFFECTED BY CAST IRON SPACER PLATE

Spacer plates in diesel engine oil pumps used to be made of soft steel stampings. However, because of manufacturing difficulties and resultant high costs, an interchangeable gray iron casting was developed and recommended.

The results were completely satisfactory from every standpoint. Surface-ground on both sides, the iron casting was delivered at one-third the cost. And because it eliminated eight in-plant operations, this initial saving was raised to a total of 88%.

This is another example of how modern iron castings can reduce costs and solve many of the problems of industrial product design.

Hanna Furnace provides foundries with all regular grades of pig iron . . . foundry, malleable, Bessemer, intermediate low phosphorus, as well as HANNA-TITE® and Hanna Silvery.

Facts from files of Gray Iron Founders' Society

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THE BEST KNOWN NAME IN IRON

THE HANNA FURNACE CORPORATION
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Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

Circle 612 on Page 53

of classification of graphite. Work also started on the international working groups, including that organized by France on founding properties of alloys and those arranged by Germany on bonding materials and on coke. A British offer to organize an international committee on the development of methods of testing raw materials used in the CO_2 process was accepted.

The social program included banquets for all delegates and for members of the International Committee and visits for ladies and delegates to nearby historic sites. A special performance of a Spanish ballet also was presented for congress visitors.

As far as possible, technical sessions were organized into groups with some common interest.

Internal Tearing—In the session devoted to steel, two papers were presented on the progress made with studies carried out at Massachusetts Institue of Technology, on behalf of the Steel Founders' Society of America, on hot tearing in steel. I. Minkoff (Israel), and C. W. Briggs and H. F. Taylor (U.S.A.) reported that internal tearing in steel castings is determined by the geometry of the cast section, which controls the type of stress imposed on the solidifying metal. Thus in a straight bar of square cross section, tears propagate from the central shrinkage cavity to the axes of the four sides; in a rectangular section, the tear moves along the two shorter axes.

If a square section ring is cast around a central core, it behaves as a straight bar if the core diameter is large. As the core diameter becomes progressively smaller, however, it influences the heat flow on the one side of the square section and alters the form of the tear. In heavy flanged cylinders, tearing is radial or longitudinal depending on the amount of bore reinforcement beneath the flange. The stress is due to the temperature gradient between the surface of the casting and that at the front of the advancing wall of solid metal, the geometry influencing the temperature distribution.

Hot Tearing Test Pieces—K. Beckius (Sweden) and M. C. Flemings and H. F. Taylor (U.S.A.) described the development of a hot tearing test piece which gives reproducible results. This involves four bars of varying length, individually fed and individually gated, provided with bracketed flanges at the ends of the bars remote from the ingates. Increase in carbon from 0.25 to 0.51 per cent decreased hot tearing. At pouring temperatures producing columnar structures, high temperatures reduced tearing by accelerating mold breakdown.

Tears were classified as "open" tears (which might or might not appear on external surfaces); "internal" tears, associated with unsoundness; and "healed" tears, in which the tear had been filled with liquid metal from the interior of the casting. Adequate feeding eliminates interior tears and heals external tears after they have formed. Brackets prevent tearing and work by local acceleration of cooling which transfers the stress to cooler, stronger regions.

Surface Pinholes—J. Pribyl and O. Starosta (Czechoslovakia), who were not present to give their paper, dealt with surface pinholes in steel castings which for many years were troublesome in their country, especially on thin-walled castings made in green sand molds.

The pinholes now are attributed to decomposition of water vapor on mold surfaces followed by surface oxidation of the steel, with a consequent carbon reaction to form carbon monoxide and subsequent diffusion of dissolved hydrogen into the CO blowholes. They were cured by complete deoxidation, avoidance of later oxidation of the melt, and avoidance of hydrogen pickup from wet refractories (especially where boiling is impossible, as in induction furnaces) or from electrolytic alloy additions.

Porosity—O. Heide (Germany) described a detailed study of porosity in carbon steel castings made in bentonite-bonded sand molds and shell molds in relation to hydrogen content. Sampling could be conducted on the steel after it had passed through the mold. Moisture content of the mold made little difference. Increasing pouring temperature from 2930 to 3110° F multiplied the hydrogen content by about twenty times.

Shell molded castings of a different shape gave rather lower hydrogen content values, but still de-

In the interest of the American foundry industry, this ad (see opposite page) will also appear in

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MODERN CASTINGS
IRON AGE
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MEASURE

the dollar-saving difference

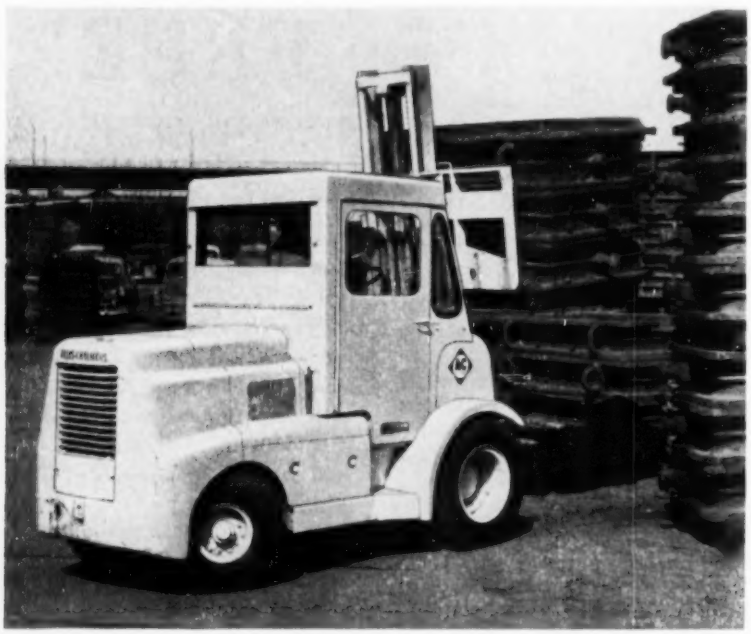
...in inches — stacks to a height of 128¼ in., highest of them all with standard mast. Its 106¼-in. length (less forks) is the shortest.

...in pounds — 10,250 lb of balanced stability — most rugged truck in its class.

...in percent — climbs a 30-percent grade fully loaded. This is more than the gradability of any other 6,000-lb pneumatic — proof of its superior power-weight-balance combination.

...in hours — based on the experience of users, 10,000 hours or more before major engine overhaul is about par for the course. The heavy-duty industrial engine is designed specifically to work under lift truck conditions.

Let your Allis-Chalmers dealer show you how you will be dollars ahead by *any* unit of measure with an Allis-Chalmers lift truck. He will be glad to demonstrate. Allis-Chalmers, Milwaukee 1, Wis.



The Allis-Chalmers 6,000-lb pneumatic lift truck is available with choice of single or dual front wheels—standard or POWER SHIFT transmission — diesel, gasoline or LP gas engine — plus power steering and many other optional accessories.

ALLIS-CHALMERS

BH-1258

pended greatly on temperature. Moisture content of the air also increased the hydrogen content of the steel. Definite limits of hydrogen content were established above which porosity appeared; these depended on degree of deoxidation (content of silicon and presence of aluminum).

Solidification and Crystallization—B. Matuschka (Austria) discussed solidification and crystallization processes in steel castings, particularly in ingots made with either metal or sand molds. The paper dealt with the form of the advancing crystal wall and gave values for volumetric contraction at various stages of solidification for carbon contents up to 2.5 per cent. The effect of these changes on shrinkage and on the strength of the castings was considered.

Flow of Metal—Another session was devoted to general foundry questions dealing particularly with the flow of metal and its effect on sand. M. Jeancolas, G. Cohen de Lara, and H. Hanf reported a further stage of the work being carried out in France on a hydrodynamic study of the flow of molten metal in gating systems. The first part of the paper is a survey of the theory of the subject. The second part deals with a comparison of the flow of liquids at room temperature in plexiglas models with the flow of molten metal in sand molds.

It was demonstrated that there can be good correlation, differences being due to cooling of the molten metal during flow and to erosion of the runner system. The prevention of aspiration of air could be studied in models. It is confirmed that the flow distribution in a gating system depends on the ratio of the cross-sectional areas of the ingate and of the entire system. Although hydraulic laws are applicable, the accuracy can not be great until the volumes of the controlling coefficients can be determined for each system. Further work is going on to obtain these data.

Bonding Clays—J. Navarro Alcacer (Spain) put forward a theory to connect the flowability of bonding clays with the internal friction angle (derived from the theory of Mohr's circles). He suggested that the strength of sand can be related to the reciprocal of the internal friction angle. The paper described

Circle 613 on Page 53

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start you with a dry bottom, with no joints. Easiest to install. Sizes 50 to 10,000 pound in stock. Larger sizes to your specifications.

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Circle 614 on Page 53

methods of measuring the angle and described experimental results on that relationship at various moisture contents.

K. Shobayashi and H. Okamoto (Japan) reported a technical advance in their development of equipment to take x-ray films of the flow of high-temperature metals in shell molds. This work involved the use of an x-ray image intensifier made for medical studies which increased the brightness of the image on a fluorescent screen by 500 to 1000 times and permitted the exposure of film at speeds up to 250 frames per second. An impressive film showed the flow of ductile iron into a range of shell molds with a variety of gating systems.

Grain Structure — V. Kondic (England) successfully provoked discussion in a paper on grain structure of sand castings. A clear distinction had to be drawn between the characteristics of the grain (or cell in a eutectic alloy or primary grain in a solid solution alloy) and the characteristics of the microconstituents associated with the grains. Some simple experiments on aluminum of commercial purity and high purity showed that in the former, the effect of pouring temperature might be more important than that of cooling rate, but that the super pure material was insensitive to both. These phenomena, together with some reported on aluminum silicon eutectic alloys, cannot readily be explained by current theories on nucleation.

Metal Penetration—K. Fursund (Denmark) presented a paper on metal penetration in molding sand. By using low melting point alloys such as tin-bismuth in molds bounded with a glass wall, he studied the mechanics of the penetration of the metal into a normal clay-bonded sand without the usual complications arising from high-temperature chemical action. The controlling physical laws were found to be the same at all temperatures, although penetration proceeded in a series of jumps, the depth of which depended on metal pressure. Sand could be penetrated even by metal at its melting point when the sand was considerably colder than the metal. It appears that there must be local fluctuations in surface tension.

Scab Formation — A paper by

In Milwaukee, The Vilter Manufacturing Company uses . . .

3/4 inch of BERLITE to line 2600 lb. ladles

BERLITE-lined 2600 pound ladle

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REFRACTORY GATING COMPONENTS

• The *Thinwal* construction, providing as much as *35% lighter weight* will not spall nor erode in use even at temperatures up to 3250°F. They eliminate slag inclusions, stop rejects, reduce cleaning room time.

Standards and specifications bulletin available on request. Units for special applications quoted.

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Circle 616 on Page 53

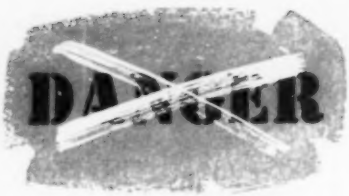
H. G. Levelink (Holland) studied the formation of scabs and spalling on sand surfaces by introducing hemispherical sand samples into a furnace at 2550° F. The spalling process was shown clearly in a film. With this test, the effects of surface coatings, sand composition, oil content of core sand, and additions such as silica flour were studied. Thickness of the spalled layer was observed and the mechanism of the spalling process analyzed.

Steelmaking—In a session devoted mainly to the properties and production of high duty gray iron, B. Trentini, P. Vayssiere, J. Francais, and M. Allard (France) dealt with their studies of steelmaking processes using injection of powdered lime in a stream of oxygen into a molten pig iron bath. The work was carried out on a wide variety of converters with capacities from 30 to 50 tons using the O.L.P. process and in openhearth furnaces where the lime addition had to be related carefully to the requirements of the slag. A third process was carried out in a 4-ton ladle on a 4 per cent C, 0.5 per cent Si, 1.6 per cent P iron at about 2550° F and reduced the silicon and phosphorus to low values while losing about one quarter of the carbon.

Modulus of Elasticity — A. S. Amat (Spain) described an investigation on a series of experimental test bar castings to determine the factors controlling modulus of elasticity, such as cooling velocity, section size, and type of graphite. A series of graphs plots the modulus in relation to eutectic saturation value, graphite content, size of graphite, and cast bar and test bar diameters.

Mechanical Tests—Some of the results of an extensive investigation involving several thousand mechanical tests carried out on a national scale in Belgium were described by A. de Sy and J. van-Eeghem. The main objective was to determine whether Collaud's formula based on Brinell tests coupled with a separately cast tensile test piece to determine the tensile strength of the casting was applicable in Belgian conditions. Graphs were constructed showing the relationship of section thickness, Brinell hardness, and degree of eutectic saturation.

It was found that when the ten-



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General Mills

Circle 617 on Page 53

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Circle 618 on Page 53

sile strength was calculated, it fell within 10 per cent of the actual measured strength in 80 per cent of the tests and within 15 per cent in 90 per cent of the tests (provided that the form of graphite did not change, as in very thin sections). The statistical evidence also was held to demonstrate that there was no significant difference in the values of tensile strength measured on comparable waisted (diabolo) test pieces and on test pieces with a parallel portion.

Gray Iron Metallurgy—N. G. Chakrabarti (India) dealt with the metallurgy of gray iron and indicated that in his foundry, high duty iron is made by melting an all-steel charge with coke in a basic arc furnace and transferring the melt to a low-frequency holding furnace for final adjustments of composition and inoculation.

Ferroalloys — H. W. Wilder (U.S.A.) discussed the use of ferroalloys and inoculants in the production of high-strength gray iron to meet different specifications, either on different base charges or with the addition of various alloy elements to the same base charge. Details of sizes of addition materials, precautions to be observed, and the effects of minor elements were noted. Attention was drawn to the use of new techniques such as injection of powdered materials in inert gases.

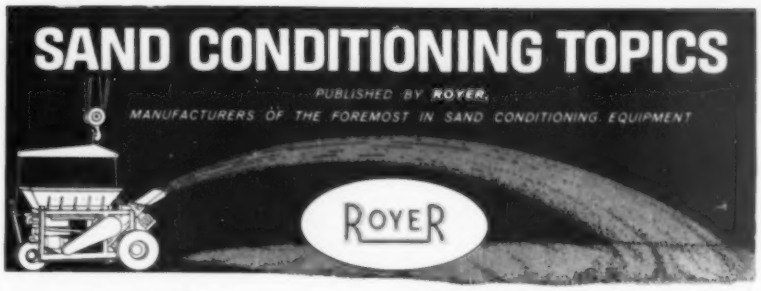
(To Be Concluded)

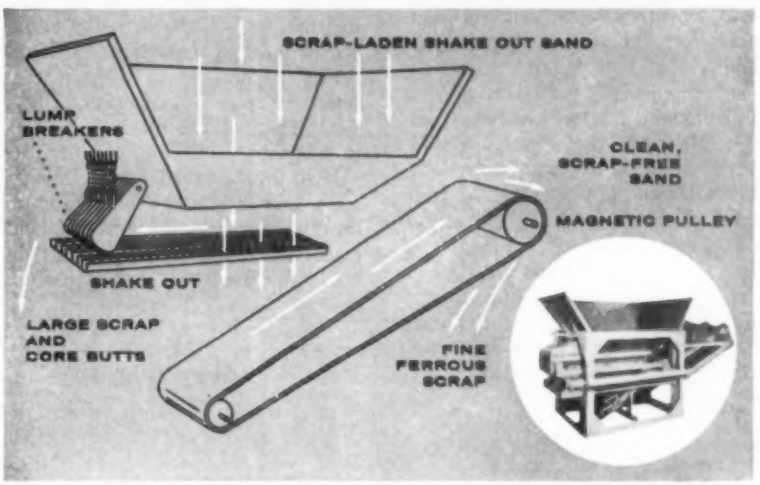
Book Review

***Zinc, The Metal and Its Alloys*, edited by C. H. Mathewson, cloth, 723 pages, 6 x 9 in., published by Reinhold Publishing Co., New York 22. Price $19.50.**

Over fifty specialists in the field of zinc, in co-operation with the American Zinc Institute, participated in the preparation of this book to provide a comprehensive treatise on the subject. Its 14 chapters range from historical matter to industrial and other applications of zinc and its compounds.

Topics covered include economics and statistics, geology, chemistry and physics of zinc technology, treatment of ore, metallurgical extraction, and refining. Other chapters deal with manufacture of zinc oxide, processing and uses of metallic zinc and zinc-base alloys, etc.





Sand Contamination Drains Your Profits

Periodic business recessions in the foundry industry point up the need to eliminate waste and excessive hand labor—or sacrifice profits. In one area of foundry operation—sand contamination — important strides have been made in stopping the profit drainage.

Tramp iron damage usually occurs at the muller, conveyor belts, aerator or patterns. Patterns faced with contaminated sand produce poor casting finishes and high scrap loss. Probably the most efficient and economical way to remove contamination and produce clean sand is with a Rover Scrap Control Unit.

Referring to the drawing, shake out sand from the molding floor is dumped by front-end loader into the receiving hopper. Large scrap is riddled out by the Shake-Out and discharged at convenient wheelbarrow height for collection and removal.

Ferrous scrap small enough to pass through the grid openings of the Shake-Out is separated from the sand by a magnetic pulley at the upper end of the conveyor belt. Depending upon the degree of mechanization you employ, clean sand discharge may be made to a skip hoist feeding a muller, conveyor belt, or into the hopper of a Stationary Royer Separator and Blender for cooling, aeration and blending. We recommend discharge onto a heap for transporting by front-end loader to a Portable Royer Separator and Blender at the molding station for cooling, aerating and fluffing.

If tramp iron is the cause of any of your profit loss, we invite you to discuss your problem with the foundry-wise Royer agent serving your territory. He'll explain how a Rover Scrap Control Unit can pay for itself in less than two years, stop your profit drainage and improve the quality of your castings.

Your first step in stopping profit drainage caused by sand contamination is to mail the coupon for our latest Scrap Control Bulletin. We'll send it without obligation—plus the name of the agent who serves you.

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Circle 619 on Page 53

Foundry Developments

By EDWIN BREMER

Metallurgical Editor

Lead Battery Alloy

INVESTIGATION of suitable alloys for the positive grids of lead-acid storage batteries indicates that addition of barium and tin to the lead should give excellent results. Information in "A Lead-Tin-Barium Alloy for the Positive Grinds of Lead-Acid Batteries" by Parr, Muscott and Crocker in the June issue of the *Journal* of the Institute of Metals (London) states that a lead, 3 to 3.5 per cent Sn, 0.07 to 1 per cent barium alloy gives a combination of castability, stiffness, creep strength, and resistance to strong anodic stress-corrosion.

Long-Life Cast Muffler

CAST aluminum muffler shown in the center of the accompanying illustration is designed to eliminate need for replacement of single and

Aluminum muffler resists corrosion

dual exhaust systems. According to L. W. Wickson, Centr-O-Cast & Engineering Co., Detroit, the muffler is competitive in cost and weighs only 60 per cent as much as present short-life units.

Developed with technical assistance and support from Reynolds Metals Co., the cast muffler is said to take advantage of the thermal and casting qualities of aluminum to achieve balanced heat distribution which virtually eliminates internal corrosion. Aluminum's natural freedom from rust and resistance to corrosion eliminates most of the external damaging factors. Internal corrosion is said to be prevented by minimizing condensation through fast warm-up on engine start and controlled heat distribution through variations in wall thickness obtained through casting.

New Aluminum Alloy

IMPORTANT feature of a high-strength aluminum alloy developed by North American Aviation Inc., El Segundo, Calif., is reported to be the addition of small amounts of beryllium which modifies or counteracts the harmful effect of iron.

Composition of the alloy, called Tens-50, shows 7.6 to 8.6 per cent silicon, 0.4 to 0.6 per cent magnesium, 0.15 to 0.3 per cent beryllium, 0.1 to 0.2 per cent titanium, 0.2 per cent zinc max., 0.1 per cent copper max., 0.2 per cent manganese max., 0.3 per cent iron max., other impurities each 0.05 per cent max., other impurities total 0.15 per cent max., aluminum remainder.

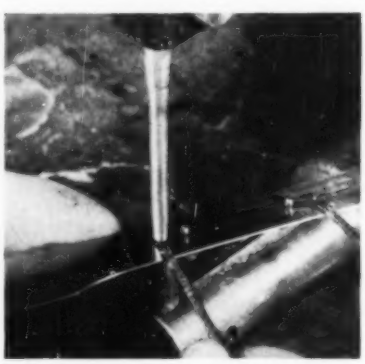
Prevents Contamination

COMPLETION of a study for Mallory-Sharon Metals Corp., Niles, O., indicates that use of a water-cooled copper crucible is technically feasible for induction-melting reactive metals, according to Battelle Memorial Institute, Columbus, O. Employing a specially designed, segmented crucible, commercially pure titanium was melted without contamination.

The new process does not require a specially prepared electrode since all types of raw material, including scrap, can be melted and can produce high-quality metal in a single melt. Indications are that the process may be applied in production of specialty steels. Mallory-Sharon recently was awarded a contract by the Air Materiel Command to construct and test a 14-in.-diam induction furnace with a water-cooled copper crucible for melting reactive metals such as titanium.

Prevents Slippage

NEW method of attaching extensometer arms and temperature recording thermocouples to test specimens to undergo protracted elevated-temperature testing is shown in the accompanying illustration. Developed by engineers of Boeing Airplane Co., Seattle, the technique for the extensometer arms centers around welding of ordinary 3/32-in. diam steel balls to the test specimens under precisely controlled conditions of temperature, force, and cleanliness. The balls attach to sockets on the extensometer arms in the usual ball-and-socket linkage. This practice is claimed to eliminate any slippage or loosening which might occur with conventional clamping of extensometer arms. Welding of the thermocouple wires also prevents them from becoming loose as well as providing a positive fused metal-to-metal contact. Six different alloys tested with the method from room temperature to 1650° F are said to have given excellent results in 93 per cent of the elevated temperature tests.



Forms ball and socket inkage

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Used in place of rectangular tight flasks, these round slip flasks and jackets will turn out more good castings with less sand, reduce investment in flask equipment and increase production capacity.

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HINES FLASKS

Left—Fred Hagquist, Freeman Supply Co., addresses pattern seminar. *Right*—Speaker T. O. Kuivinen, Cooper-Bessemer Corp., left, and W. E. Eccles, Cooper-Bessemer Corp.

Eastern Foundrymen Meet at

Empire State Conference

By WILLIAM G. GUDE
Managing Editor

● SUBJECTS related to sand, patterns, metal, casting design, and gating were the principal items for discussion at the successful Empire State Regional Foundry Conference held in Syracuse, N. Y., Oct. 1-2.

The meeting, which was held at Drumlins Country Club, was sponsored by four of the New York state chapters, the Ontario Chapter, and the Northwestern Pennsylvania Chapter of the American Foundrymen's Society. Attendance totaled about 150.

Technical sessions were conducted in the afternoons, and the two mornings were devoted to visits to Oberdorfer Foundries Inc., the Crouse-Hinds Co., Meloon Bronze Foundry Inc., and Patternmakers Inc.

At the opening day's luncheon, A. A. Henninger, mayor of Syracuse, welcomed the foundrymen to the city. Robert J. Sloan, president, Crouse-Hinds Co., presided. Kenneth A. Digney, president, Oberdorfer Foundries Inc., was chairman of the conference banquet, at which the principal speaker was Newell Brown, assistant secretary, U. S. Department of Labor, Washington.

Mr. Brown discussed some of the functions of the Department of Labor, including the accumulation of facts relating to the country's labor requirements. He referred to the future need for skilled workers and cited the survey conducted a short time ago with the assistance of the foundry industry to determine the number and types of additional skilled men which foundries indicated they would need in the years ahead. This was the first of a series of studies being made in various industries.

Pattern Seminar — Two sessions were devoted to the production and application of plastic patterns. Speakers were William V. Frid, chief chemist, Tylene Plastics Inc., Michigan City, Ind., and Fred M. Hagquist, the Freeman Supply Co., Toledo, Ohio. It was pointed out that while epoxy resin patterns do not wear as long as metal patterns, they are superior in many respects to wood, and can be replaced more quickly and more cheaply.

Among the recommendations given for preparation of plastic materials were use of the correct amount of hardener, thorough mixing, and attention to temperatures. Since heat affects the rate of cure, summer temperatures may result in too fast a cure unless the material is cooled. Curing is retarded when the temperature drops below 70° F. Steps in the preparation of epoxy tooling were depicted by a movie, and slides showed various applications.

Sand Clinic — Two sand clinics were conducted by Victor M. Rowell, vice president, Harry W. Dietert Co., Detroit. Mr. Rowell gave a comprehensive discussion of the selection, preparation, and use of sand, together with an analysis of the effect of various sand properties on casting quality.

Other topics considered were the effect of mold hardness on permeability and compression of sand, the influence of moisture on sand density, hardness, green deformation, compressive strength, and hot deformation. In discussing sand distribution, it was pointed out that while a sand of broad distribution has many advantages, it is more susceptible to segregation than a sand which is contained on a relatively few number of screens. Among other subjects treated was the role of sand in causing cuts, washes, and other defects.

Casting Design — Better communication is needed between the designer and foundryman, it was stated by T. O. Kuivinen, chief engineer, technical division, Cooper-Bessemer Corp., Mount Vernon, Ohio. For best results, each should understand the other's problems. In this way, a team effort results and costs can be reduced.

Mr. Kuivinen pointed out that the quality of the test bar may or may not represent the strength of a casting. To date, no standard

Manganese, an element essential in cast iron, is available to the foundry industry in a number of ferro-alloys.

No single manganese alloy is right for all irons and melting conditions. Rather, specific manganese alloys and sizings have been developed which provide maximum economy and effectiveness for specific applications.

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procedures have been developed for correlating the strength of a test bar to that of a casting. He recommended the cutting up of scrapped castings to obtain bars for testing.

Gray Iron Practice—Factors to watch in cupola operation were discussed by Walter A. Sokolowski, foundry superintendent, Remington Rand Inc., Ilion, N. Y. He recommended the determination of the size of coke best suited to the foundry and constant adherence to its use. Bed preparation should be standardized and not varied.

The cupola operator should understand the implication of a rising or falling bed. The former is accompanied by loss in slag fluidity and a lighter color of slag, more wool, an increase in temperature, and more flame at the charging door. A falling bed is accompanied by increased slag fluidity and a darker color, increased melting rate, declining temperature, and an increase in chilling tendency.

Foundries should pay more attention to the bad effects of hot sand. Water additions to control sand temperature are desirable if the process can be controlled. Otherwise, the sand supply should be increased.

Gating and Risering—Gating and risering of nonferrous alloys was discussed by Joseph Allen, Federated Metals Division, American Smelting & Refining Co., Newark, N. J. He reviewed the application of various types of gating, including bottom, top, and vertical systems. Kiss gating often proves successful for high production of small castings, one advantage being that the gate may break off the casting during blast cleaning.

In general, placing the runner in the drag and the ingate in the cope appears to be the best arrangement. Over-risering should be avoided, as should the placing of risers too close together. In some cases a combination of chills and risers proves most successful.

Some general principles to be followed for effective gating of various types of metals were outlined by J. O. Kura, Battelle Memorial Institute, Columbus, Ohio. He presented formulas to be used in determining the type of flow—turbulent, streamlined, etc.—to be expected in molds and in establishing dimensions for gates and sprues. Aspiration of gases and air into the metal can be expected where channels of dissimilar size join, in sharply curved channels, or in use of a straight sprue.

Information Aid for Inventors Offered by Patent Office

U. S. Patent Office pamphlet entitled "Patents and Inventions—An Information Aid for Inventors" contains basic information about patenting and patent procedures and related information on the development and marketing of inventions.

A question-and-answer section of the pamphlet offers aid in answering questions often posed by an inventor. Copies are available through the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., for 15 cents each. The price for larger lots is $11.25 per 100 copies.

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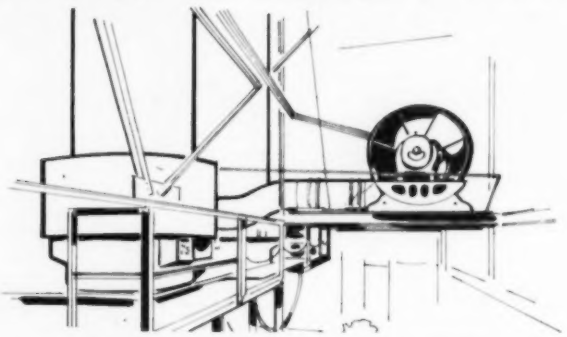

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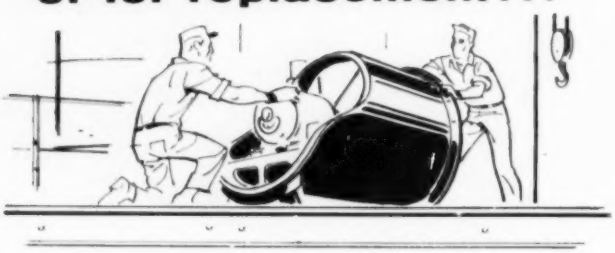

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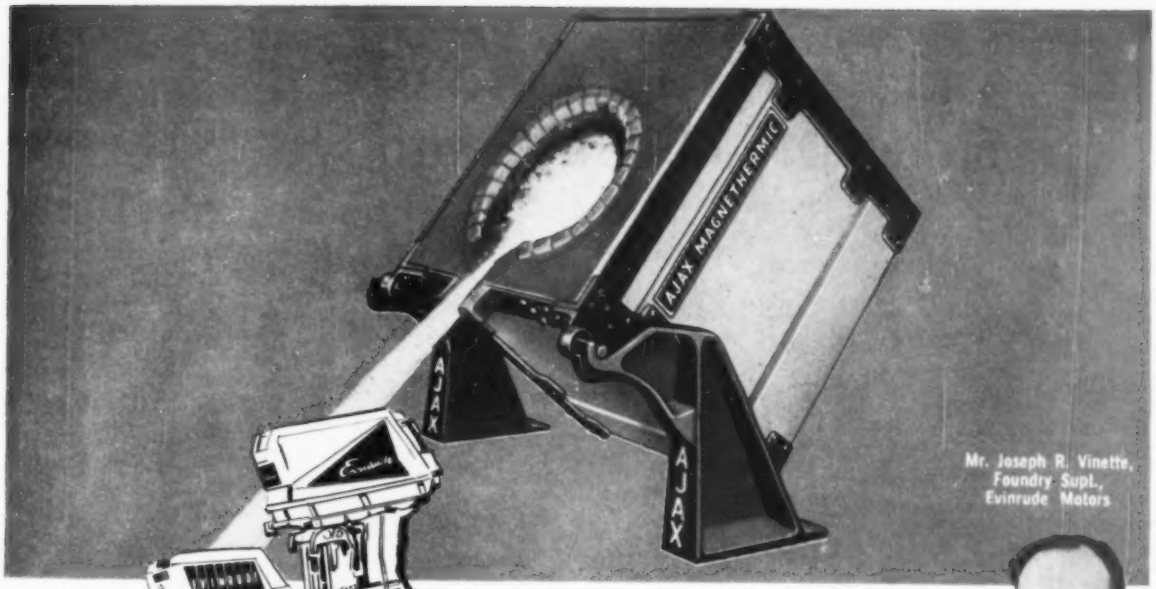

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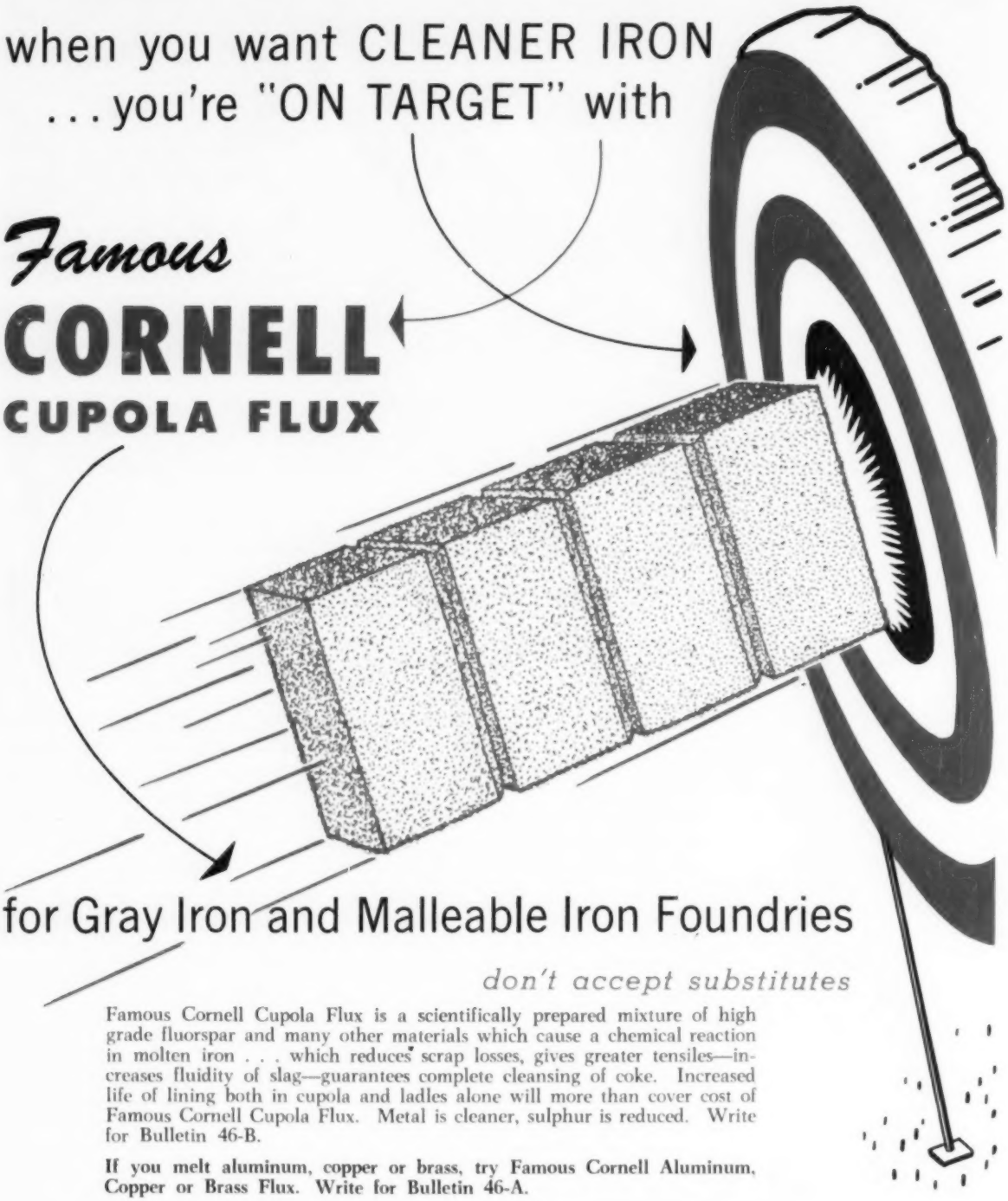

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Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"Short order, loose pattern work won't make any foundry rich, but it might be a means of getting new business and increasing the old"

Finding Friendly Foundries

● LAST WEEK a friend phoned me regarding eight gray iron castings he wanted. He suspected that they would be beyond the melting capacity of the Lee Hobby Foundry, but wondered whether I could put him in touch with a local foundry which could and would handle the job. With several outfits in mind, I said "Glad to" and promised to call him back.

After two hours and thirty-two minutes devoted exclusively to digging up telephone numbers and making calls, I had to ring up my friend and tell him I was licked. Every single one of the foundries I had contacted was not interested in the job. All were specialists within rather tight areas of work and had no provisions for miscellaneous, small-lot, loose pattern bench or floor work.

When I stopped to think of this experience, it wasn't too surprising. I guess it's common knowledge that the almost universal trend toward mechanization has just crowded out the oldtimer journeyman on bench and floor who could mold and cast almost any pattern placed in his hands, including some which were practically uncastable. Spot checks on my many foundry visits all over the country prove this situation to be more than a suspicion.

The very first foundry I called had been in business for more than 50 years, making gray iron castings of every kind and description, in quantities from singles to sustained, large quantity production. I know for a fact that it had played an important part in the development and growth of some of our most distinguished industrial organizations. It came as a shock when people at this company told me they had closed their gray iron foundry.

There's a Beginning—Now here is what is confounding my poor old bean. With the wide variety of metal products being designed, improved, tooled, and manufactured in this area, somebody has to make the first castings which start the all-important chain reaction. Maybe there is an underground traffic in motion—bootleggers of small-lot castings, with secret foundries like illicit stills hidden away in buildings disguised as warehouses, dry cleaning establishments, or social clubs.

Twentieth century museum piece

While admitting that this is largely a wide stretch of the imagination, I can't help think that if some promising firm living in sin with expensive and inadequate casting substitutes did catch a glimmer of light, after two and a half hours of searching for the foundry needle in a haystack with no results, he'd be likely to say "To the heck with it!" and go back to his evil ways.

As president of the Lee Hobby Foundry, I know that it is almost silly even to dream of making a killing from miscellaneous, short-order loose pattern work and that serving engineering and experimental groups never can pay off to any handsome degree by itself, at least in comparison with highly mechanized quantity production. But it seems to me that from the standpoint of breeding future quantity sales, or let's call it sales promotion, a setup for the sole purpose of serving these groups might turn out to be one of our most effective means of getting new business and holding and increasing the volume of the old.

If such an activity were looked on as a business-getting means and

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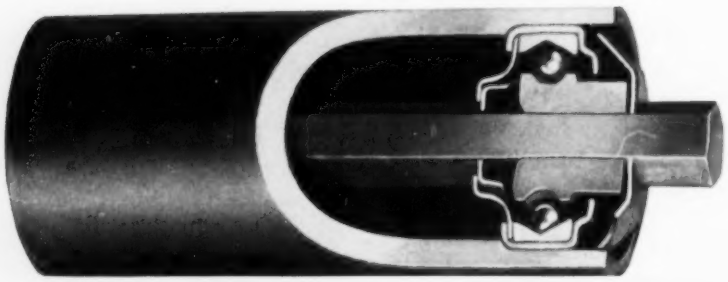

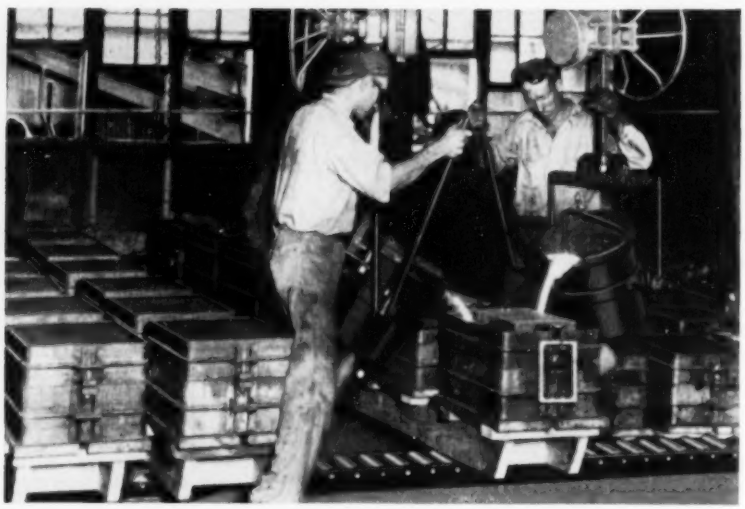

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Standard's bearings are specially engineered for heavy duty foundry service . . . protective shielding keeps dirt from entering bearing. They are grease-packed at the factory for added protection and minimum maintenance. Provision made for regreasing to flush bearings.

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kept within good business bounds as measured by the same yardsticks we use to determine advertising and other good-will-building budgets, we could afford to take on work of this kind on a breakeven basis and still profit handsomely from it. At least that's the way it seems to me. To keep from going off half-cocked, I checked this observation with one of the best and most successful foundry managers I have ever met and found him seeing eye to eye with me, and with enthusiasm.

Can't Hide the Light — Even though we did set up effectively to do this job, it wouldn't be worth the effort unless we found some way of letting the right people know about it and of reminding them of it. Classified telephone directories come to mind automatically, but I must say that from my most recent experience with that noble book, the copywriters who prepared the ads I saw must not have had their hearts in their work. The information they supplied was vague, to say the least. I think a good job in this field would pay off well.

Then, of course, there's direct mail to carefully selected and screened lists, mail prepared especially for the eyes of those with casting say-so. I see no reason why we in the foundry business can't take advantage of the proven sales promotional devices used successfully in other lines. I say this because up and coming, go-getting, money-making foundries already are doing it, and doing it splendidly.

I don't think there is any question that getting in on the ground floor through service to product development and tooling people plus giving up this doggoned hiding of the old foundry lights under bushels will pay off satisfactorily. At least, that's the way it looks from up here in the Lee Hobby Foundry.

Novo Pump Enlarges Activity

Novo Pump & Engine Co., Lansing, Mich., has purchased capital stock in the National Steam Pump Co., Upper Sandusky, Ohio, and also has purchased the entire product line of American-March Pumps, Battle Creek, Mich., production of which will be moved to the Upper Sandusky plant.

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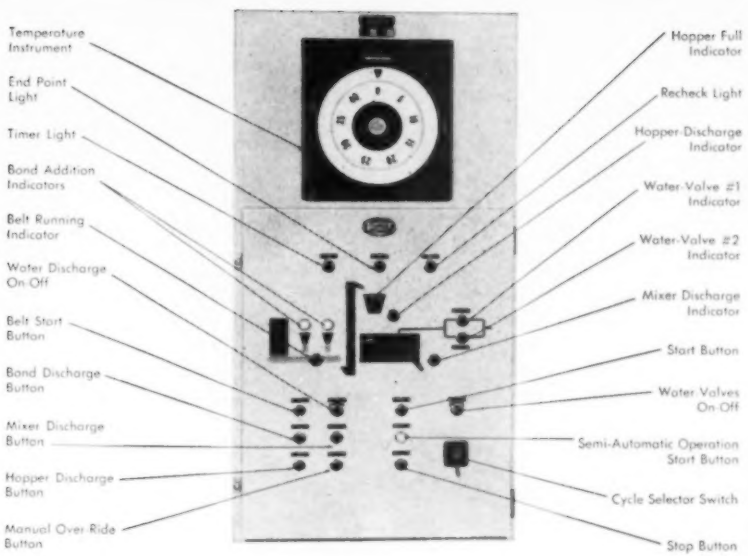
DIETERT-DETROIT

End Point Automatic Moisture Controller



Unit illustrated is No. 3917 Combination End Point Automatic Moisture Controller and Automull.

The No. 3907 Dietert-Detroit End Point Automatic Moisture Controller . . . highly accurate and quality engineered along traditional Dietert lines . . . automatically regulates the addition of water to sand in a mixer, to produce tempered sand with any desired moisture content.

1. Continuous "recheck" throughout the mixing cycle protects against moisture loss and guarantees maximum accuracy.
2. Base water is added rapidly and blended in over the full cycle. Physical properties of every batch are fully developed.
3. End point is reached slowly to prevent overshooting and assure accuracy.
4. Sand is automatically discharged when correct moisture is stabilized. Cool batches that contain nearly tempered sand are quickly cycled through the mixer. Tonnage is increased and handling costs reduced.
5. Highest quality components minimize maintenance.
6. Constant batch size not necessary.
7. No moving parts in mixer.
8. Single dial controls swift, easy changes in the moisture level and handles a number of different sands.
9. Sealed, plug-in relays and delay timers assure fast, simple maintenance.
10. Cabinet is dust-proof NEMA type 12.
11. Includes remote panel box with sequence indicator lights and control switches.

MAXIMUM **molds per man**

KEEPS PRODUCTION **moving**

reduces CASTING LOSSES

SCRAP RATIO SLASHED TO A **minimum**

DIETERT
QUOTES YOU COMPLETE WITH EVERY ACCESSORY YOU NEED!
NO HIDDEN EXTRAS!

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Circle 626 on Page 53

OHIO FOUNDRY CONFERENCE

Covers Technical Developments

By EDWIN BREMER *Metallurgical Editor* and ROBERT H. HERRMANN *Associate Editor*

DAN E. KRAUSE
Conference Chairman

● APPROXIMATELY 280 attended the eighth Ohio Regional Foundry Conference held Oct. 22-23 at Deshler-Hilton Hotel, Columbus, Ohio. Central Ohio Chapter, American Foundrymen's Society, was host, with the Canton, Cincinnati, Northeastern Ohio, and Toledo chapters participating.

At the opening general session, H. A. Bolz, dean of engineering, and Prof. Mars G. Fontana, chairman, department of metallurgical engineering, Ohio State University, spoke on **Engineering Education and the Foundry**.

Dean Bolz outlined educational, personality, and attitude requirements of an engineer and summarized by saying that an engineer must have the knowledge and ability to use foundry engineering to the advantage of individual foundries and to the industry. Prof. Fontana described changes in the Ohio State engineering curriculum. Basically it involves a 2-year pre-engineering program plus 3 years of professional engineering studies. He outlined the complete 5-year program, stressing the fact that it includes courses in the humanities.

Applications of the CO_2 Process in the Foundry was the subject of a panel discussion which opened the technical sessions. E. H. King, Hill & Griffith Co., Cincinnati, was discussion leader. Panelists were Charles Ward, American Radiator & Standard Sanitary Corp., Cincinnati; Joseph Gillespie, Ohio Steel Foundry Co., Springfield, Ohio; Dan Chester, Archer-Daniels-Midland Co., Cleveland, and Frank Illenda, Diamond Alkali Co., Painesville, Ohio.

Mr. King stated that the CO_2 process permits rapid production of cores and molds. Higher costs of binder and gassing appear to be offset by reduction of baking and some handling and finishing operations. Typical applications of the process in making molds and cores for production of aluminum, copper-base, gray iron, and steel castings were cited.

Panel discussion indicated that clogging of vents in blowing operations can be minimized by periodic steam cleaning. Silicate build-up on patterns and coreboxes can be minimized by use of wax-base release agents. Ordinary lacquer on boxes and patterns may lead to difficulty. Polyvinyl type coatings are recommended. In certain applications hollow CO_2 cores made by use of wooden blocks which are removed after gassing will eliminate cracking of castings.

Close tolerances on casting dimensions can be achieved with high-quality patterns and coreboxes. In a foundry producing copper-base alloy castings ranging in weight from about 0.32 oz to 3 lb, a tolerance of $\pm$ 0.005 in. is obtained. In another, austenitic gray iron ring castings 4 in. OD, $3\frac{1}{4}$ in. ID, and $\frac{5}{8}$ in. high are made to a tolerance of $\pm$ 0.007 in.

GRAY IRON

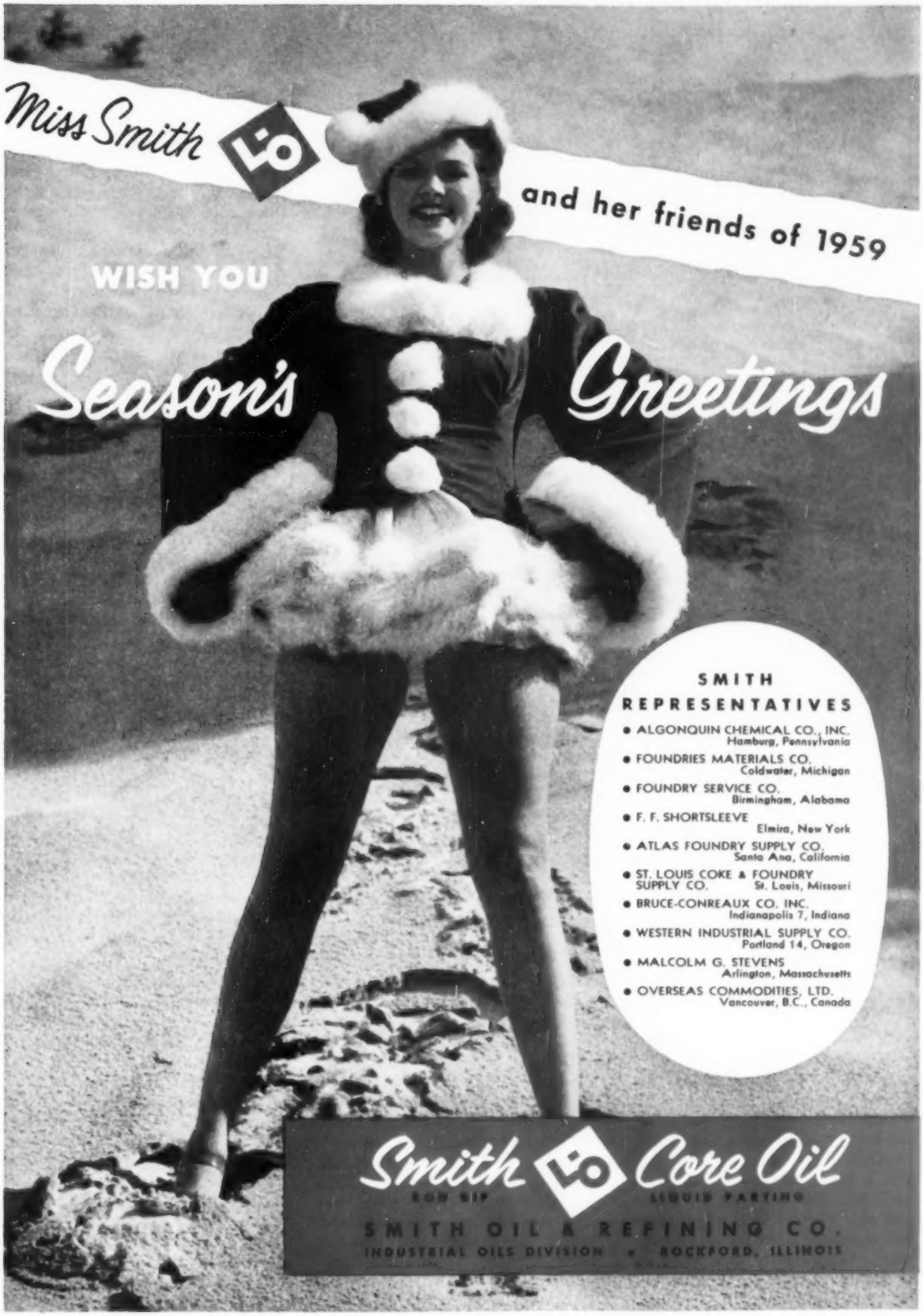
Inoculation—Control Tool for Acid and Basic Cupola Melting, by A. P. Alexander, International Harvester Co., Memphis, Tenn. Iron melted for inoculation has a composition that would produce hard castings if a controlled amount of graphitizer were not added before the metal is poured. Inoculation does not necessarily change the chemical analysis of the iron; it refines the structure and develops higher strength.

The practice of inoculation forces a foundry to use simple, yet conscientious and consistent control over metal production. Inoculation practice improves acid cupola melted iron but is not an essential procedure. It is, however, essential in basic cupola melting practice.

Manufacturing Procedure and Economics Using Cold-Set Oil Bond, by Frank Dettore, G. E. Smith Inc., Pittsburgh. A number of factors must be kept in mind when making cores and molds with cold-set, oil-bonded sand. Setting time is affected by the amount of accelerator used in the mix and the mixing time. Because of the relatively short setting time, close co-ordination is needed between mixing and coremaking or molding operations.

The use of sand mixes with air-setting binders is growing. Advantages claimed are good dimen-

Prof. MARS G. FONTANA
Opening Session Speaker



Circle 627 on Page 53

Photos courtesy Joseph A. Riley Jr., Cooper-Bessemer Corp.

Left to right are George B. Greenwood, conference treasurer; Dallas M. Marsh, program chairman, and N. H. Keyser, arrangements chairman

sional tolerances, good collapsibility, less pattern wear, and less finishing time on molds. Curing time is hastened by use of an ignitable mold spray. Molds can be poured as soon as the spray has been burned.

Operation of Water-cooled Cupolas, by Mervin H. Horton, Deere & Co., Moline, Ill. Beginning with the first experimental operations with water cooling, the speaker illustrated the various changes and problems encountered, and then described present practices with water-cooling on the cupola shell. Water cooling permits melting larger tonnages than indicated by conventional cupola ratings, lower operating costs, and longer cupola operating time. Water-cooled cupolas can be banked for 16-hour periods, and can be operated for five days before dropping the bottom.

Risering of Gray Iron and Ductile Iron, by Prof. John F. Wallace, Case Institute of Technology, Cleveland. Prof. Wallace discussed the subject of risering in the November, 1959, issue of FOUNDRY. Please refer to Page 74 of that issue.

STEEL

Hot Tears in Steel Castings, by J. A. Rassenfoss, American Steel Foundries, East Chicago, Ind. Hot tears occur at hot spots which concentrate contraction strain. Formation is in the last metal to solidify, and this will be high in sulfur and phosphorus. Steel temperature and chemistry affect hot tear formation. Tests showed the influence of sulfur, manganese, carbon, silicon, tin, and aluminum contents.

Strong, dense cores increase likelihood of hot tearing. Plastic sand mixes reduce tearing possibilities. The use of hollow cores or cores with a dense exterior and plastic sand interior can reduce the possibility of hot tearing. Streamlined casting design or the use of chills to reduce temperature gradients in castings will reduce tearing susceptibility. Also cracking ribs can be used in critical cases.

Sand, by George Vingas, Magnet Cove Barium Corp., Arlington Heights, Ill. Properties of binders and additives and their effects on steel foundry molding sand mixes when water is added were discussed. The materials include clays, cereal, silica and zircon flour, iron oxide, and stabilizers such as ground corn cobs, wood flour, and oat hulls. Some of these materials are useful in producting castings without defects; others are not.

More research is needed on causes of defects so methods and materials can be developed to prevent them. Work also is needed to develop values for important properties of molding sand so improved formulations can be developed and consistent practices maintained.

Acid Electric Steel Furnace Practice, by Jerry Hathaway, Massillon Steel Castings Co., Massillon, Ohio. He showed slides of his foundry's operations in producing castings weighing from a few ounces to 3000 lb. Information was given on ladle and furnace preparation and repair. Since the power demand meter is some distance from the furnaces, Massillon installed a closed television circuit so operators can maintain control of power within the prescribed limits. This system permits a reduction of power costs. Metal temperature is determined with platinum-iridium thermocouples.

Metallurgy of Cast Steel, by Charles K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala. Using constitutional diagrams the speaker described the various phases of solidification and heat treatment. Since solidification occurs through skin formation, feeding is less a problem than in other alloys which solidify through other processes. Effects of the commonly used alloys for improving properties in steels and those used for deoxidation to secure sound castings were discussed.

NONFERROUS

Experiences in Melting Brass by Induction, Indirect Arc, and Crucible Methods, by A. W. Bardeen and W. J. Amsbary, Ohio Brass Co., Mansfield, Ohio. Presented by Mr. Bardeen. Each type furnace has advantages for melting certain alloys. The three types are required for a satisfactory foundry melting department. Melting speed, melt quality, flexibility, labor cost to operate, working conditions around the furnaces, floor space required, investment cost, refractory cost and life, and cost per unit of metal melted were discussed for each type furnace.

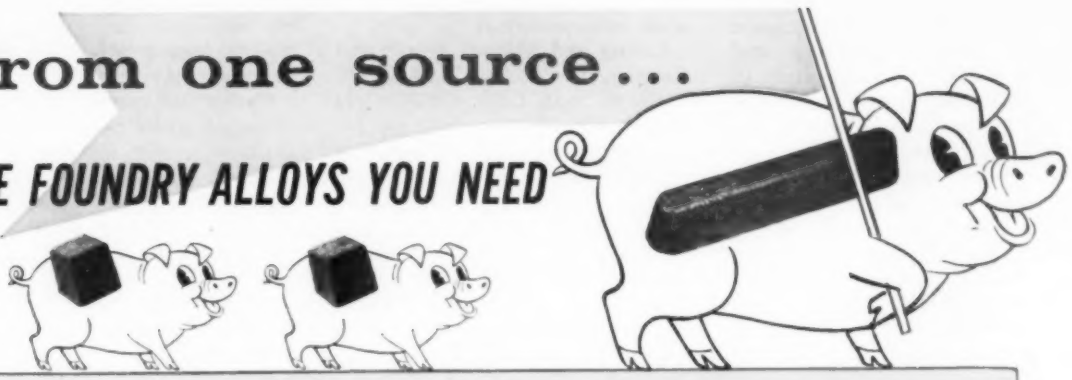
Metallurgy of Aluminum and Magnesium, by E. E. Stonebrook, Aluminum Co. of America, Cleveland. Mr. Stonebrook authored a thorough discussion of these alloys in the September, 1959, issue of FOUNDRY. Please refer to Page 90 of that issue.

Permanent Molding of Aluminum Alloys, by Peter Petto Jr. and Russell Seher, Arrow Aluminum Castings Co., Cleveland. Mr. Petto stated that permanent mold castings have the advantages of good appearance, close dimensional accuracy, good physical properties with comparatively thin-walled sections, reduced machining requirements to obtain finished parts, and competitive price.

Most commercial alloys can be cast except those which have extreme hot shortness. The most critical factors to control in production of permanent mold castings

From one source...

THE FOUNDRY ALLOYS YOU NEED



ALLOYMET ADDITIVE ALLOYS

Available in pig, piglet, bar and shot

ALLOYMET Number	Nominal Analysis	General Application
1000 1002	99.8 Cu 98.5 Cu	addition of Cu to irons
2000 2008 2041	99.5 min. Ni 92 Ni, 5.5 Si 59 Ni, 29 Si	addition of nickel to irons and steels
2130 2140 2165	70 Ni, 10 Cr 60 Ni, 15 Cr 35 Ni, 15 Cr	nickel and chrome alloying of iron and steel
2154	46 Ni, 20 Cr	production "Ni-Hard"*
2200	57 Ni, 23.5 Cu, 8 Cr	production "Ni-Resist"*
2350 2365	50 Ni, 50 Fe 36 Ni, 64 Fe	addition of nickel to cupola and ladle
2454 2468 2480	46 Ni, 20 Mo, 15 Cr 32 Ni, 10 Mo, 15 Cr 20 Ni, 20 Mo, 20 Cr	engineering irons
2530	70 Ni, 30 Cu	Ni and Cu to iron
2530 mlg (QQ-N-288A)	62 min. Ni, 26 min. Cu, 2.5 max. Fe	"Monel"* castings
2523 2530M	60 Ni, 23 Cu 65 Ni, 30 Cu, 5 Fe	Ni and Cu to steel

*INTERNATIONAL NICKEL COMPANY

All SAE, AISI and ACI Stainless Steel Master Alloys

DUCTIMET INOCULANTS FOR DUCTILE IRON

Available in All Screen Sizes

	Mg	Si	Cu	Ce	Fe
DUCTIMET #30	8	45	5	—	Balance
DUCTIMET #35	8	45	5	0.5	Balance
DUCTIMET #31	12	39	16	—	Balance
DUCTIMET #40	9	46	—	—	Balance
DUCTIMET #45	9	46	—	0.6	Balance

ALLOY METAL PRODUCTS, Inc.

World's largest producer of secondary nickel alloys

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Circle 628 on Page 53

are mold and gate design, mold coating, mold temperature and pouring cycle, and temperature of the metal being poured. Selection of the proper alloy for the part also is important.

Mr. Seher described aluminum permanent mold foundry operations observed during a recent visit to England and Germany. In general, castings are more complex than those produced here, inspections are more critical, resulting in minimum customer returns, and mold maintenance is excellent.

Gating and Risering Nonferrous Castings, by William Ball Jr., R. Lavin & Sons, Cincinnati. While there are more than 3000 copper-base alloys, they may be classified in about seven groups, including copper-tin, copper-zinc, copper-lead, copper-tin-zinc, copper-nickel, copper-aluminum, and copper-silicon alloys. Characteristics of each group differ, and for suitable risering and gating one should have knowledge of such characteristics as feeding, flowability, shrinkage, tendency toward fuming and frothing, and pouring range.

Gating and risering are functions of design of the casting, and sound castings require directional solidification. Indication of the rate of solidification can be gained by determining the ratio of casting volume to its surface area.

MALLEABLE IRON

The Foundry Supervisor's Viewpoint of Molding Sand and Its Control, by Gene Medley, Webster Mfg. Co., Tiffin, Ohio. Changing from a natural molding sand to a synthetic type to eliminate sand problems was a gradual development at Webster. Satisfactory results were obtained by blending 80 per cent lake sand with 20 per cent finer sand. This sand is a four-screen type with 40 per cent on the middle two, and it was found that 5 per cent sand on the 270-mesh screen was desirable for obtaining satisfactory smooth surfaces.

About 6 per cent bond composed of three parts southern and one part western bentonite is used. Moisture content is about 4½ per cent. Fine seacoal and corn cobs are added for good peel and to eliminate scabbing. The sand conditioning equipment operator is an important man in a sand control program.

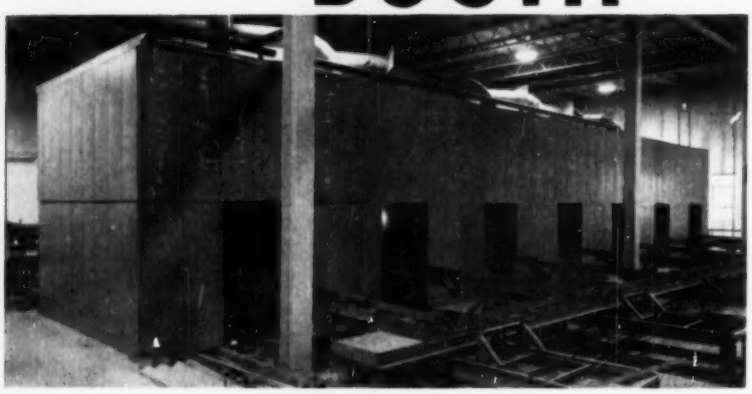
Solidification and Feeding of Malleable Iron, by B. C. Yearley, National Malleable & Steel Castings Co., Cleveland. Mr. Yearley presented a thorough discussion of this subject in the September, 1959, issue of FOUNDRY. Please refer to Page 116 of that issue.

GENERAL SUBJECTS

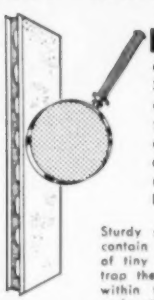
A Sound Maintenance System Pays Off, by Russel Smith, Unitcast Corp., Toledo, Ohio. Good maintenance may be the difference between profit and loss. However, there is no ideal system; each foundry must develop its own workable system.

Five basic categories comprise a good maintenance system: 1. Personnel, involving trained supervisors and maintenance-educated, skilled workers. 2. Advance planning for routine and extraordinary maintenance plus capital expenditures. 3. A cost system for accumulating data which then must be interpreted correctly to be of value.

ISOLATION BOOTH



for noisy factory operations



ISOLATE the din and clatter of loud factory operations easily and quickly. Noises can be absorbed or isolated with Koch's easy-to-erect Soundbar Panels. Standard dimensioned panels fit together rapidly to construct a room-within-a-room to control the clamor of factory, mill, or foundry. Noise is not only isolated, it is muffled as well. The unique design of Koch's Soundbar Panels permits "chain erection" to complete a sound suppressed room in hours instead of days. These incremental modular panels lock tightly into each other to form rigid walls of any length . . . any height.

Sturdy steel panels, four inches thick, contain sound-silencing filler. Millions of tiny pores in the skin of the panel trap the sound waves and muffle them within the blanket of insulation. Reverberations within the room or booth are reduced to a minimum.

Simple to erect
Minimum installation cost
Sturdy, all-steel welded panels
Vermin-proof, noise-proof, dust-proof
Light weight, easy to handle
Sound absorption coefficients up to 99%

DESIGNING ENGINEERING FABRICATING

- Exhaust Systems
- Air Make Up Systems
- Ventilating Systems
- Finishing Systems for Wood and Metal

Since 1873, Koch's vast experience serving business and industry has made them experts in engineering the transfer and control of heat, cold, dust, fumes and sound!

WRITE FOR SPECIFICATIONS AND DATA — DEPT. F49

GEORGE KOCH SONS, INC.
Evansville 4, Indiana

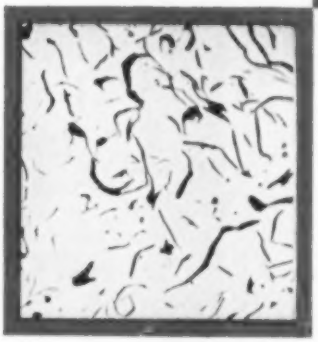
No.8® GRAPHITIZER

TREATS GREY IRON EFFECTIVELY FOR LESS THAN 10¢ PER TON!

Thousands of foundries are already employing No. 8 because it is such an amazingly simple and accurate graphitizer. No. 8 is a powerful inoculant. It plants graphite *throughout* the molten metal. No. 8 gives castings a higher machinability rating. It reduces chill and hardness in thin sections and improves wear and shock resistance. No. 8 makes castings more metallurgically uniform and, most important of all, No. 8 graphitizer *substantially reduces the cost of metal control* (cost figures in several foundries are below 10¢ per ton of metal treated). No. 8 is easy to apply by funnel or envelope method. As the photomicrographs shown here indicate, No. 8 is effective for special metallurgical control. From every standpoint it will pay you to use No. 8, regularly. For further details write for Engineering Bulletin No. 2.

Base Iron

Photomicrograph from broken half of 1.25 arbitration bar of grey iron not treated with No. 8 Cupola charge was made up of 48% steel, 33% cast scrap, 19% malleable pig iron and 45 lbs. of silicon briquettes. Total charge was 2544 lbs. This iron tested to the following physical properties: Transverse Strength 2,497 lbs. (wedge bar) • Brinell Hardness 229 (wedge bar) • Total Chill Depth 41/32 in., Clear Chill 26/32 in. • Deflection 0.23 in.



Treated Iron

Photomicrograph from broken half of arbitration bar of same base iron treated with 1 lb. per ton of No. 8. Holding time in ladle following addition of Graphite was less than 8 minutes. Note how the addition of No. 8 has destroyed the dendritic pattern and has given a normal flake pattern. The treated iron tested to the following physical properties: Transverse Strength 2,970 lbs. (wedge bar) • Brinell Hardness 217 (wedge bar) • Total Chill Depth 13/32 in., Clear Chill 10/32 in. • Deflection 0.31 in.

Note how the iron treated with No. 8 has increased in deflection. Usually iron treated with No. 8 will show an increase from 10% to 30% in deflection over the base iron value—this means less cracked castings and more serviceable metal.

GF240-1

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Circle 630 on Page 53

4. A records system involving minimum details and maximum information on equipment and machines in the plant. 5. Storage of necessary parts and replacement units to keep production equipment operating. Standardization of items can pay big dividends.

Cleaning Castings, by E. F. Price, Dayton Malleable Iron Co., Dayton, Ohio. Main job of the cleaning department is to fit castings to the customer's needs. It must take varied quality castings from the foundry and ship them as uniform quality items. The job is more exacting than it was 5 years ago because quality standards have gone up. Customers have better inspection tools; more parts are being converted to castings which have higher requirements than the previous parts; more castings are used in applications where a person's life is at stake.

Cleaning costs can be reduced by improving foundry processes, setting minimum standards for castings cleaning, and using proper cleaning tools, jigs, and fixtures.

Plastic Patterns, by Melvin K. Young, U. S. Gypsum Co., Chicago. Details which should be followed to produce quality patterns in epoxy resins by casting or laminating procedures were presented in a sound-motion picture prepared by the speaker's firm. Small, compact patterns are cast, but those of larger size require lamination procedure as well as metal reinforcement for proper support. Since use of epoxy resins does not require any shrinkage or contraction allowance, the resin patterns can be made directly from the single shrink, master pattern through the use of a plaster mold or cast.

Concluding session of the conference was a panel discussion on **Shell Molds and Cores.** J. W. Gillespie, Ohio Steel Foundry Co., stated that austenitic steel castings are being produced without difficulty using shell molds and cores, but good surfaces are not obtained on ferritic steels. To overcome the problem, additions of zinc oxide, manganese oxide, and iron oxide were tried without much success. Experiments are being conducted with additions of manganese sulfate and iron oxide.

Larson E. Wile, Lynchburg Foundry Co., Lynchburg, Va.,

How's this for an easy way to handle big cores?

They're hollow inside. That's why they're *one-half to two-thirds lighter to lift* than solid sand cores.

You don't have to bake them like cakes in an oven. And there's no way they can get knocked out of shape before they're done.

You cure them hard right in the core box. They don't warp because they heat up evenly over the entire core surface. They come out ready for setting and pouring.

That isn't all, by a long shot. You can get *more accurate castings* with these shell cores—castings with 5 or 10% less dead weight that has to be machined away.

Translate that saving into pieces per ton of metal poured—and you'll see why so many foundries are interested in cores bonded with Durez resin. Yes—more profitable castings.

NO HOISTS NEEDED even for cores this big at Kuhns Brothers foundry. One core, much bigger than this one, weighed 350 pounds in green sand. Shell process trimmed it down to 100 pounds; saves on handling cost and on sand.

ENGINEERS like the even wall thickness that's possible in pipe fittings cored with Durez resin-bonded shell. Foundrymen at Kuhns Brothers like the fast mulling cycles they get with Durez resin, its uniformity, and its freedom from peel-back.

25% faster machining

Next, look at machining costs. At the foundry you see here, they're tapping shell-cored pipe fittings *25% faster than ever before*—thanks to the higher feeds and tool speeds possible with the close finishing tolerances they can hold now.

They're getting longer

SHELL CORES made with a Durez foundry resin now save time on half the tonnage formerly poured using green sand cores at The Kuhns Brothers Company, Dayton, Ohio. New jobs go into shell. As core boxes need replacing they are replaced by shell. Just one sand-resin mix, the outcome of intensive testing, covers every shell-core job in the foundry.

tool life, too, because in shell-cored castings there is much less burned-in sand to dull the cutting edges.

Foundrymen all over the country get solid dollars-and-cents results like these with Durez foundry resins in shell cores.

They're using the experience of foundry-trained Durez technical men to make the switchover to shell cores as swift and painless as it can be.

They're keeping results *consistent* with the drum-to-drum, month-to-month sameness of Durez resin that makes it possible to set up standard procedures—and stick to them.

How about you? For competent help in shell cores and shell molding, call in your Durez man now.

For the latest "how-to" information on shell, get this new "Durez Guide to Shell Molding." It gives you 36 pages of authoritative, up-to-the-minute data and pictures on molds, cores, patterns, materials, mixing, temperatures, lubricants. Write today for your free copy.

DUREZ PLASTICS DIVISION

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pointed out that use of shell cores presents advantages such as reduced weight of sand, elimination of ovens and driers as well as rods and wires, and reduced size of core prints. Dimensions can be controlled more closely, labor cost is reduced, shakeout and venting are good, and blows and scabbing are reduced. From the customer viewpoint less machining is required, castings are lighter, dimensions are controlled more closely, and casting surfaces are smoother.

B. D. Claffey, G.H.R. Foundry Div., Dayton Malleable Iron Co., Dayton, Ohio, indicated that in his foundry shell molding is used in instances where the customer prefers it, where better surface finish is desired, and close dimensional tolerances required. In his opinion, shell molding costs are 10 to 25 per cent higher than for green sand, production is 25 to 50 per cent less, and costs for equipment, patterns, and maintenance are high. However, shell cores show advantages in that intricate cores are produced easily, baking time for the cores is extremely short, and surface finish obtained on castings is good.

Speaker at the Thursday luncheon was Marvin Homan, assistant director of athletic publicity, Ohio State University, who spoke on the broadcasting of sports events.

At the banquet that evening Lt. Col. Kermit W. Hardy, commanding officer, 376th Armament & Electronics Squadron, Lockborne Air Base, Columbus, described the history and activities of the Strategic Air Command. He said that several air weapons depend on foundries' ability to produce castings for their manufacture.

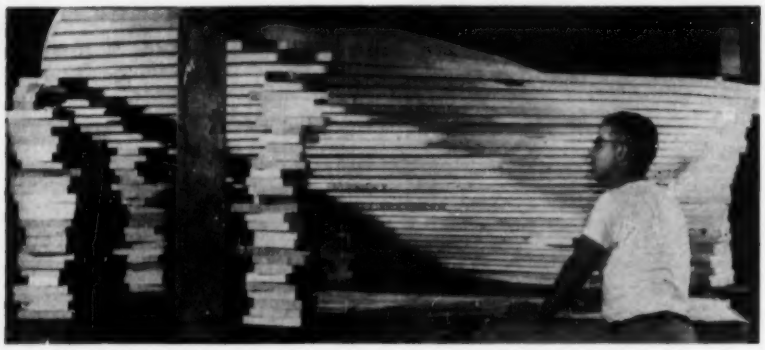
Ashley Sinnett, AFS secretary, spoke at the Friday luncheon on trends in AFS membership and reported on plans for the society's Castings Congress and Foundry Show to be held at Philadelphia next May 9-13.

A. P. Green Buys Dixie

A. P. Green Fire Brick Co., Mexico, Mo., has acquired all of the outstanding common stock of Dixie Fire Brick Co., Birmingham. Jack Q. Lewis and John W. Lewis Jr., sons of the founder of Dixie Fire Brick Co., remain as officers to manage the plant.

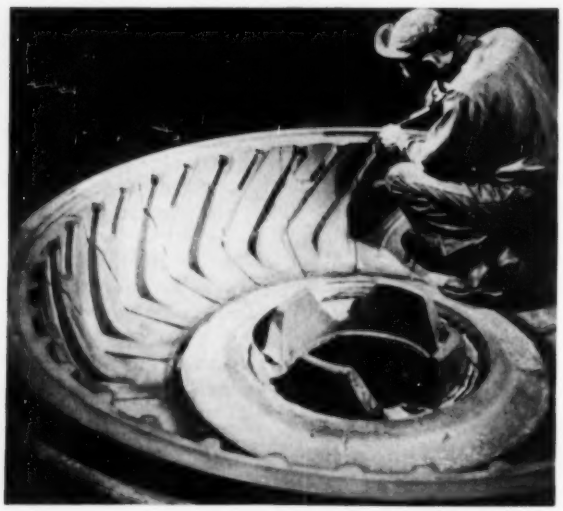
Circle 631 on Page 53

News Views

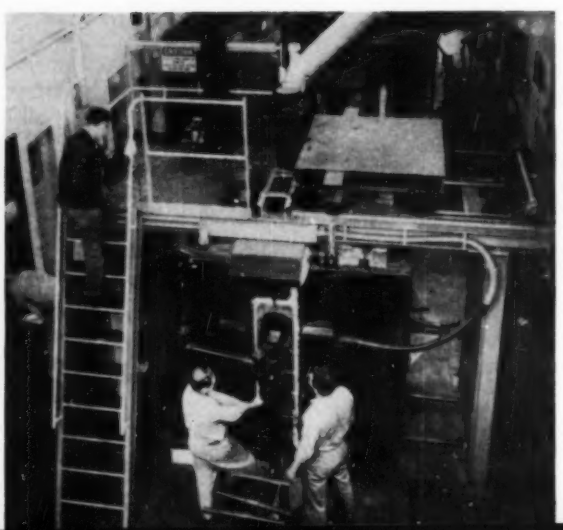


BIG WHEEL: Avondale Marine Ways Inc., New Orleans, is supplying a 20-ft diam stainless steel propeller for the 730-ft Inland Steel steamer Edward L. Ryerson, largest vessel ever built for Great Lakes iron ore trade. Patterns—that's the raw lumber shown here—and castings (five blades and hub) were produced at Avondale's Service Foundry Div.

IN TRAINING: An intensive course in nondestructive testing, including a survey of the fundamentals and methods of fabrication used in metalworking and origin of defects in materials and parts, is conducted regularly by Magnaflux Corp. at their Chicago plant. Each student, such as those shown, receives individual attention and can process actual pieces from a library of over 800 typical parts having known defects. The five-day, 40-hour sessions are limited to eight men. The time is divided equally between the laboratory inspection, class discussion, and lectures with visual aids

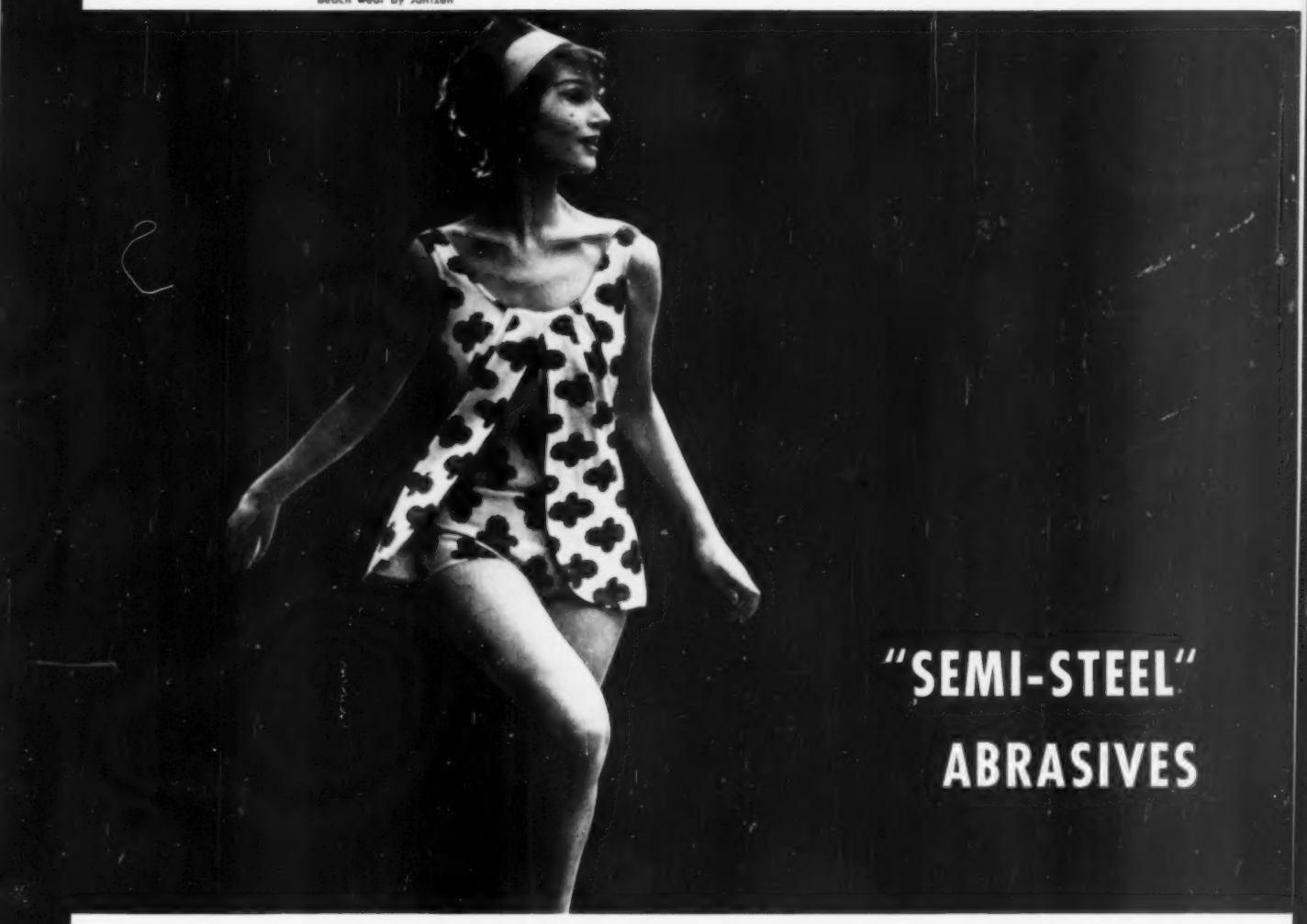


TIRE MOLD: This casting, being cleaned, is half of a mold that will be used in making rubber tires for off-highway equipment. Supplied by Engineered Castings Div., American Brake Shoe Co., Medina, N. Y., the casting is poured in sand, using special techniques to maintain smooth surface and close tolerances. It will require little finishing



RESEARCH ADDITION: Eastern Gas & Fuel Associates, Boston, has completed an addition to its research laboratory in Everett, Mass. The features include a specially designed pilot-scale coke research oven, foreground, with a movable sidewall for analysis of expansion of coal blends during the coking process. Three other test ovens are in use in the laboratory

Beach wear by Jantzen



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Circle 632 on Page 53

View of speaker's table at luncheon on the first day of the meeting. Lemuel R. Boulware, vice president, General Electric Co., speaker, is fifth from left

Industrial Relations Problems Considered at

NFA ANNUAL MEETING

By FRANK G. STEINEBACH
Editor

● OFFICERS and staff of the National Foundry Association were well pleased with results of the 61st annual meeting of that organization, held at the Hotel Roosevelt, New York, Nov. 5-6.

The program featured a series of concurrent sessions on problems encountered in negotiating with the several unions represented in the foundry industry and drew the largest audience of members in recent years.

Discussion leaders were Fred D. Hunter, manager, employee relations, American Brake Shoe Co., New York; William S. Thomas, vice president, Emmaus Foundry Co., Emmaus, Pa.; Howard Winterson, vice president, industrial relations, Blaw-Knox Co., Pittsburgh; Albert

Left to right: W. G. Greenlee, treasurer; Arthur G. Hall, president; Charles A. Carolin, vice president; and R. C. S. Potter, retiring vice president

Feature of the program was a series of concurrent sessions on labor relations problems. These men led the discussion. NFA president Arthur G. Hall is standing

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Officers and directors of the National Foundry Association

Blum, director, industrial relations, Cooper Alloy Corp., Hillside, N. J.; John Sulga, foundry superintendent, Kelsey-Hayes Co., Detroit, and Phil Hahl, controller, Sibley Machine & Foundry Co., South Bend, Ind. Staff members Charles T. Sheehan, William J. Bulman, Eugene F. Schlickman, and Martin J. Ewald also participated.

A summary presented by these discussion leaders at the final session indicated that much of the discussion was devoted to fringe benefits, cost of living clauses, pensions, and profit-sharing plans. Other topics included incentive plans, grievances, and the trend of union thinking toward company and, later, industry-wide bargaining.

To open the meeting, Arthur G. Hall, works manager, Nordberg Mfg. Co., Milwaukee, and NFA president, stated that the large attendance at the meeting reflected the trend of the times, when the steel strike, the copper strikes, and an implied railroad strike represent an effort to restore management rights to management and to eliminate featherbedding. He indicated that the NFA program is directed toward helping in that change.

The association has become the labor relations center of the industry, assembling data, providing information, and attempting to predict trends in the field of labor relations. Mr. Hall then reported on the many activities of the association during the year just past.

Charles T. Sheehan, executive secretary, discussed some of the common problem areas in foundry labor agreements. In the early part of the year, most of these problems resulted from the recession of 1958. These include seniority clauses that do not consider skill and ability, limitations in cutting the work week, rights of laid-off workers to certain fringe benefits, and increased mechanization of operations.

Tied in with the problems of increased mechanization are apprentice training requirements. Many jobs which formerly could be performed only by journeymen after a 4-year apprenticeship now can be handled by machine operators. NFA has started an intensive study of that problem to help foundry management convince the major unions that radical changes are necessary in the historical apprentice concepts.

Speaking on "Foreman Training in Labor Relations," A. B. Schwarzkopf, resident manager, United States Pipe & Foundry Co., Bessemer, Ala., said that it is impossible to divorce labor relations training from regular training programs. Foremen now manage their departments and this duty necessitates thorough training, but training for training's sake is wrong. The project must be supplemented with other programs.

Mr. Schwarzkopf suggested a division of plant functions into the following: Production and maintenance; plant engineering, personnel, quality control, and administrative. This arrangement results in a smaller number of people reporting to the head of the organization.

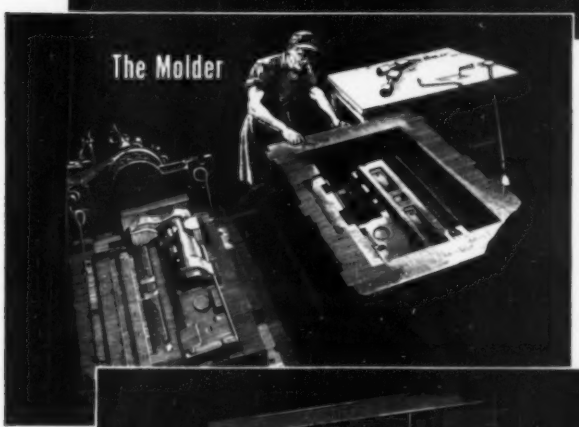
Requisites of the foreman are these: 1. Knowledge of the work. 2. Adequate education for the job. 3. Ability to lead people. 4. Willingness to accept responsibility. 5. Intelligence and willingness to learn.

Suggested subjects for training are as follows:

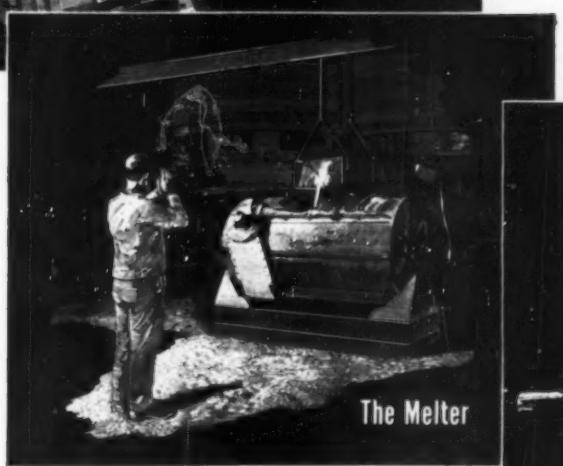
1. *Basic economics.* Many do not know how a company operates—what makes it tick.

2. *Labor relations*—The foreman plays an important part, especially in the matter of labor agreements. Meetings and conferences should be held to discuss contracts, and management should be sure the foreman understands the key parts of the contract, that he is familiar with the basic laws as they affect the job. In the matter of grievances and arbitrations, it should be recognized that a gripe is a grievance and should be considered as much in its inception as in the final stages.

3. *Human relations.* The individual should be grounded in the subject, but there may be a tendency to overemphasize. Many believe that it is necessary to sell the human relations approach. The speaker indicated that there is a



A Salute to the Men of the Great Foundry Industry



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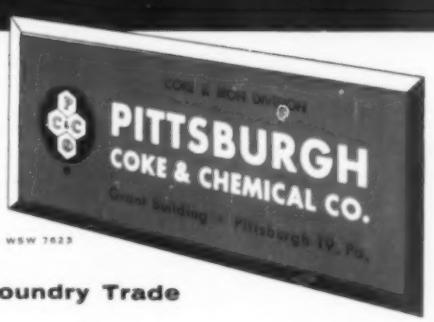

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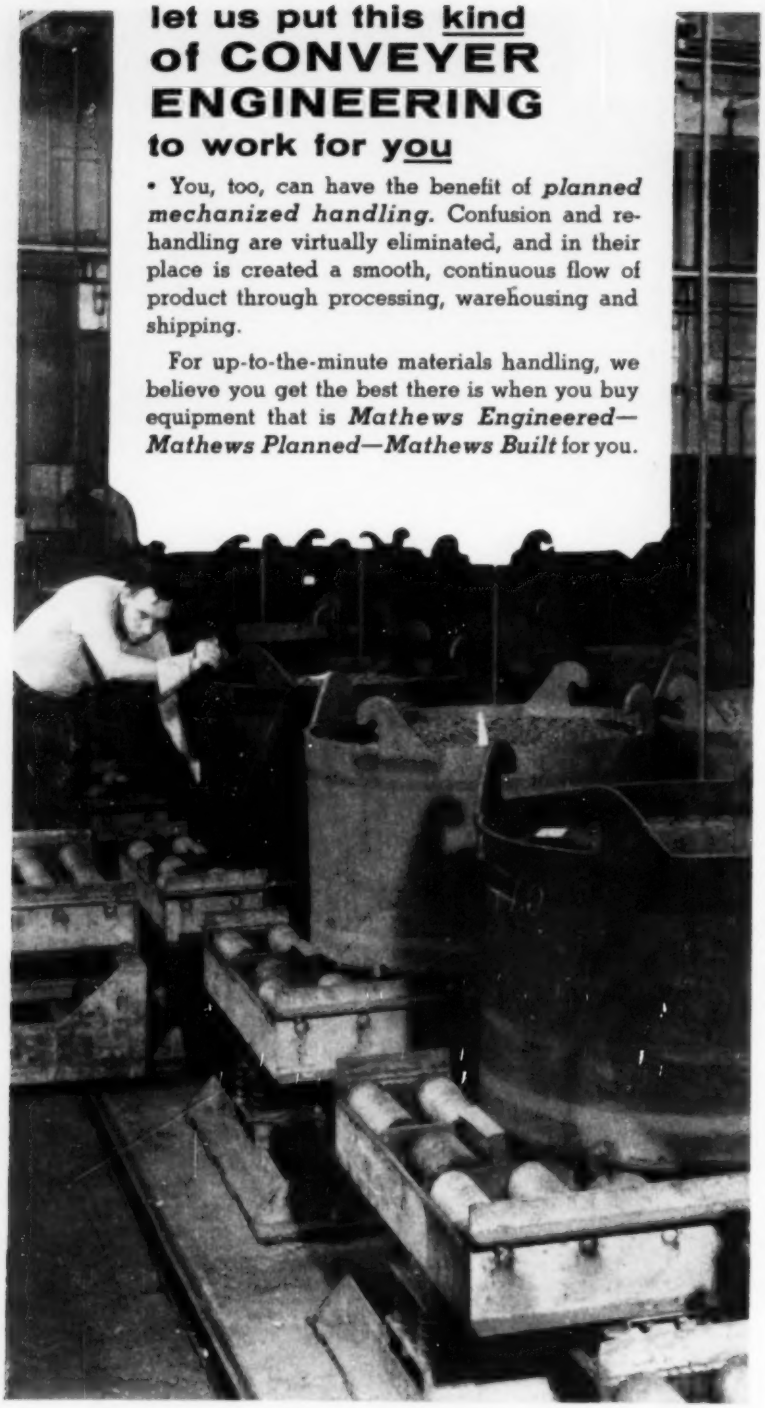

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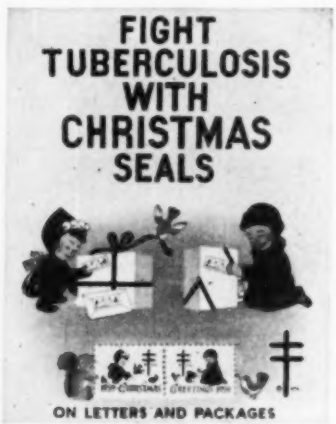
time for selling, but also a time for telling.

4. *Negotiations.* All foremen and supervisors should be completely informed on all negotiations, thereby giving them a better understanding of the problem.

In conclusion, Mr. Schwarzkopf warned against the idea that training makes the man "too good to go back to the old job." After all, that is what you trained him for. This idea indicates previous standards were too low.

Godfrey P. Schmidt, New York, warned against drift and gradual loss of liberty in both international relations and industrial relations.

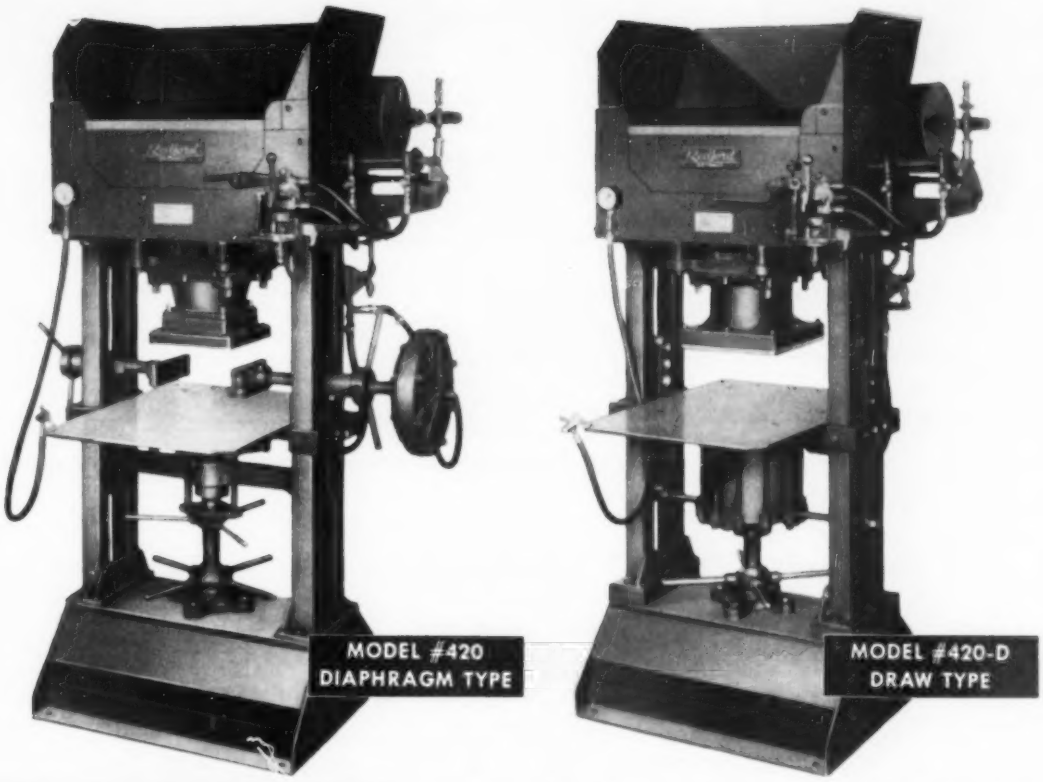


Lemuel R. Boulware, vice president, General Electric Co., New York, discussed "Achieving Bargaining Equality."

Arthur G. Hall was re-elected president; Charles A. Carolin, president, R. B. Carolin Foundry & Machine Co., Detroit, was named vice president; W. G. Greenlee, president, Greenlee Foundry Co., Chicago, was re-elected treasurer; and Charles T. Sheehan continues as executive secretary.

New members of the Administrative Council are as follows: Don E. DuPerow, Lincoln Brass Works, Detroit; Francis T. O'Hare, O'Hare's Foundry Co., St. Louis; Robert Phelps Jr., Francis & Nygren Co., Chicago; Thomas H. Tanner, Zenith Foundry Co., Milwaukee; William S. Thomas, Emmaus Foundry & Machine Co., Emmaus, Pa.; William W. Thomas, Straight Line Foundry & Machine Corp., Syracuse, N. Y.; and Cline H. Welch, Alloy Cast Steel Co., Marion, Ohio.

Circle 635 on Page 53



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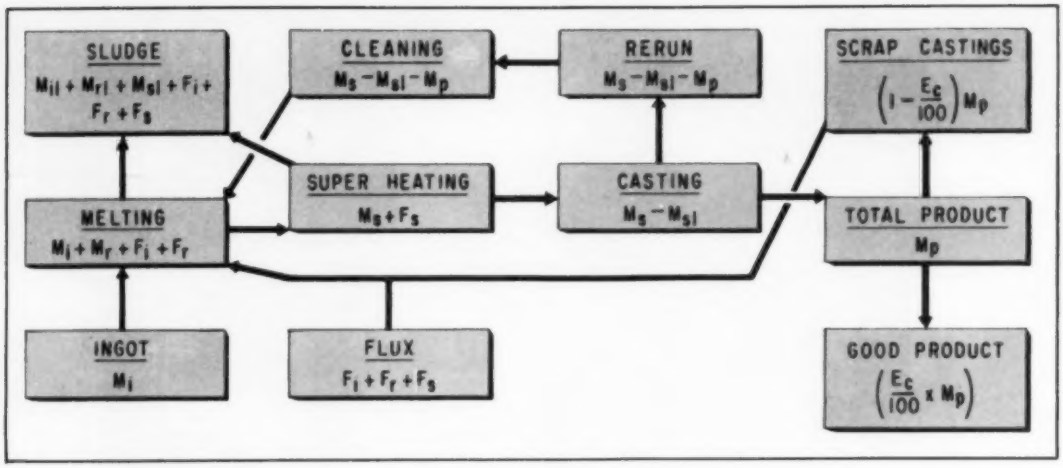


Fig. 1A—Multiple-pass sandcasting with superheating and cleaning

Achieving Metal Efficiency in

Magnesium Casting Operations

Excessive loss of magnesium alloys sometimes occurs in both sand foundries and diecasting plants, even though good techniques are used in the melting room. Here is one plan for minimizing losses

By FOSTER C. BENNETT
Chief, Casting Development
Metallurgical Laboratory
Dow Metal Products Co., Midland, Mich.

● IN SAND FOUNDRIES and diecasting plants processing magnesium alloys, excessive loss of metal may occur even though well established techniques are used in the melting room. Under these conditions, there may be an air of mystery about the disappearance of the metal. Some routine checks can be made to plug up the more or less obvious outlets for metal, then the casting process should be scrutinized carefully to determine the role of metal processing efficiency.

This paper presents one plan for such an analysis. It uses material balance diagrams based on unit metal loss values selected from typi-

Fig. 2—Showing metal loss, sludge, and flux for different poured ratios

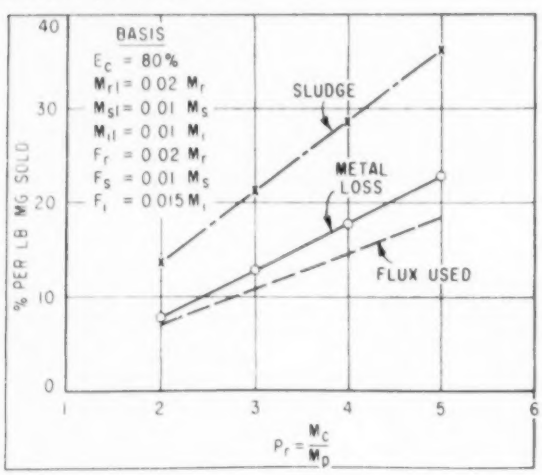
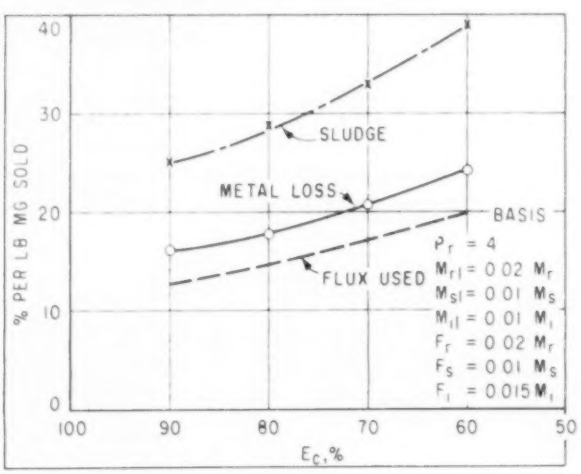


Fig. 3—Metal loss, sludge, and use of flux versus casting efficiency



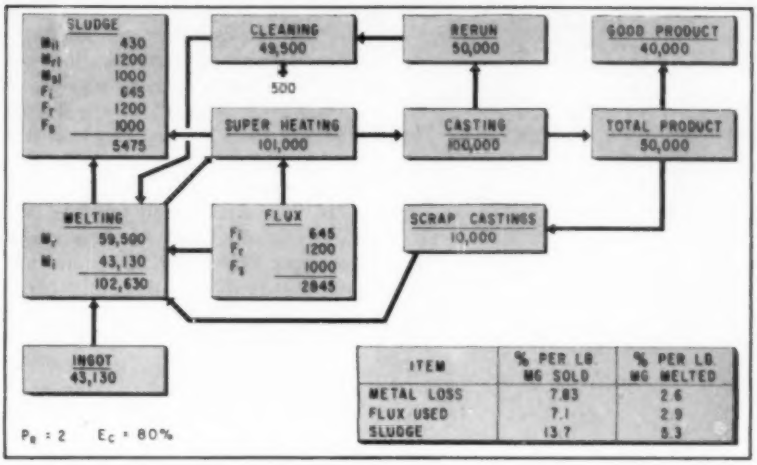


Fig. 1B—Multiple-pass sandcasting with superheating and cleaning—lb units

cal experience. A comparison then is made with *optimum* loss values, known to be attainable. The relative importance of casting efficiency and poured ratio will be developed for both sand casting and pressure diecasting operations.

Routine Metal Loss Checks—If inventory records show that magnesium alloy losses are excessive, the figures should be verified first by a careful physical inventory check. The next step is to examine melting room sludge for contained metal. Skimping on the use of flux can result in dry sludges which may retain a great deal of metal. Foundry operators sometimes charge melting pots with scrap metal containing sand or steel inserts, thus upsetting magnesium inventory figures. Control of oxidation during melting and holding is, of course, essential to good magnesium foundry operation.

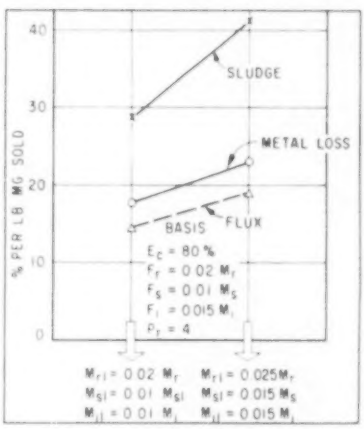


Fig. 5—Metal loss, sludge, and flux versus the unit melt loss

The casting operation can lead to significant metal losses resulting from commonly employed poor practices. Molten metal spills create thin flash of a type difficult to remelt without relatively high loss. The same is true for skulls from ladles and crucibles used for transfer purposes.

The die or sand mold may be responsible for losses due to improper processing dimensions, tending to give the customer more than the proper weight of metal. Leaking molds also may have a profound effect on metal loss. It is essential that inventory figures be based on current casting weights or actual weights from the shipping room, if available.

Trimming operations should be planned to leave a minimum amount of excess metal on the casting since very little of this material is recovered after final machining or grinding.

Typical Experience With Mg-Al-Zn Alloys—Typical experience with common gas-fired melting equipment shows that Mg-Al-Zn alloys can be melted and refined ready for use with a loss of about 1 per cent. The metal can be protected during meltdown and refined with about 1.5 per cent of a suitable flux or combination of fluxes. Rerun metal

Fig. 4—Magnesium metal loss versus poured ratio and casting efficiency

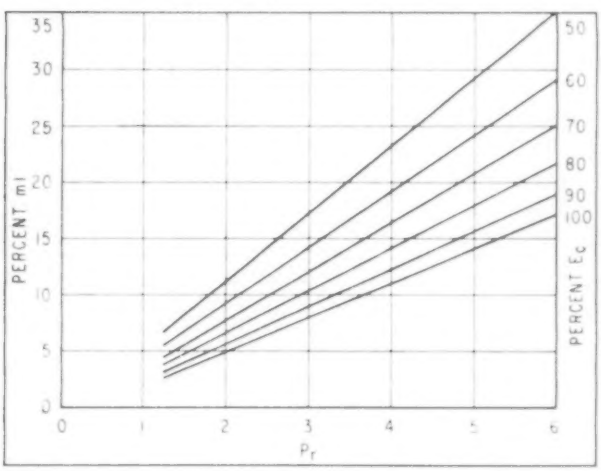
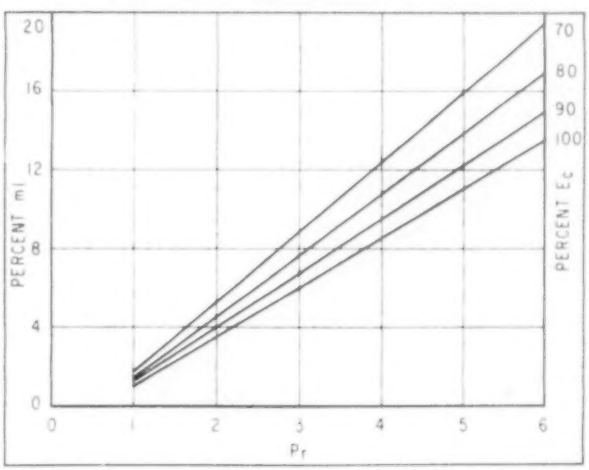
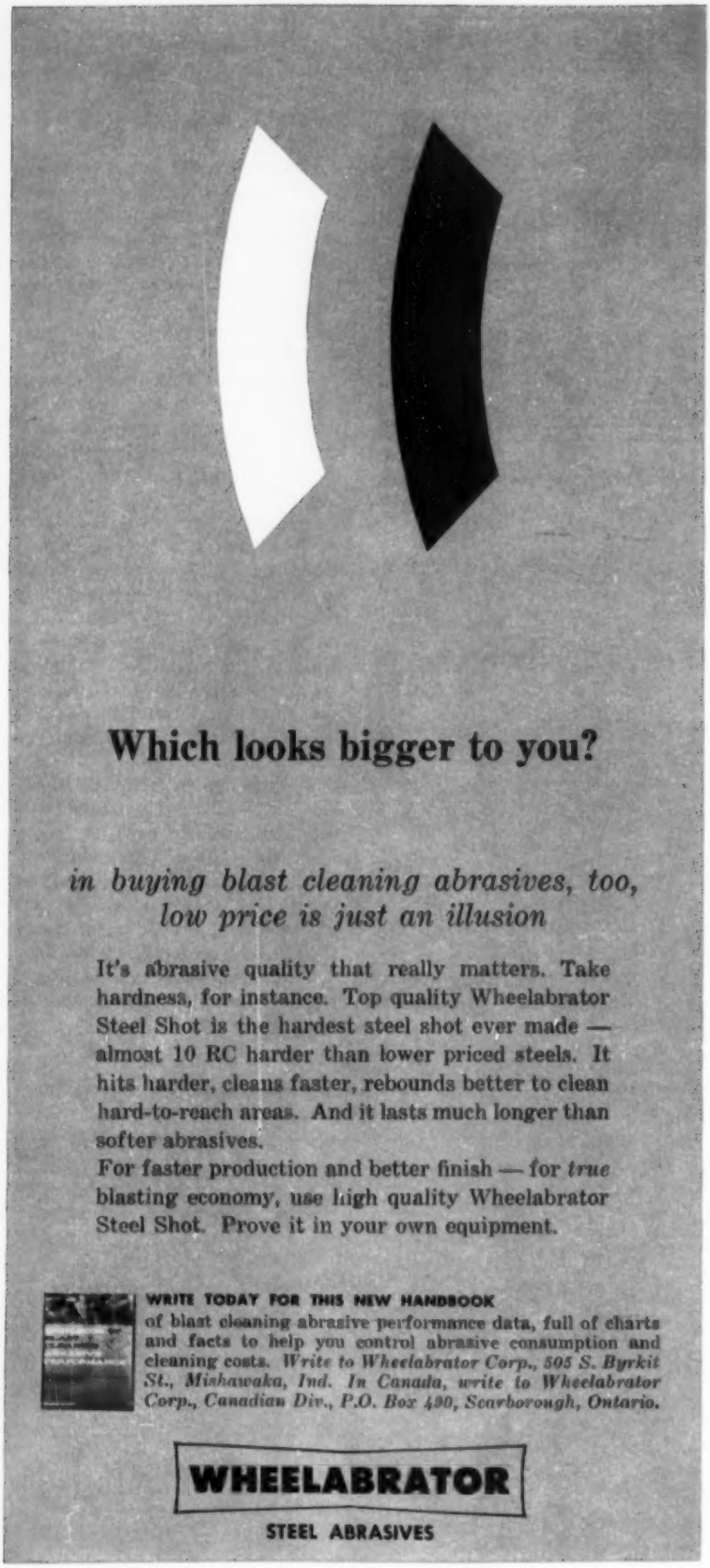


Fig. 6—Magnesium metal loss versus poured ratio—optimum operating experience

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returning from the process may be partially oxidized or contaminated with carbon or sand so that the unit melting and refining loss is closer to 2 per cent of the weight charged, and 2 per cent of flux will be needed to protect and refine it for re-use.

In the sand foundry there is a grain refining step in the process corresponding to a holding and metering step in the diecasting plant. The best information we have shows that this loss approximates 1 per cent for grain refining and something less than this for holding and metering in of diecasting. Flux usage is about 1 per cent. An average cleaning room loss of 1 per cent has been estimated from some production experience, but it must be borne in mind that this value is subject to wide variations, depending on the type of work.

Optimum Experience With Mg-Al-Zn Alloys—Although the material which follows is based on current typical experience, it is of interest to note that there is considerable room for process improvement. Performance figures for certain specialized operations show that it is possible to cut typical values approximately in half. The significance of such an accomplishment will be evaluated later in this paper.

Poured Ratio and Casting Efficiency—Assuming that the supervisor has made the routine checks described in the first section and found that everything is at least in line with typical experience, it is suggested that he carefully review his casting efficiencies and poured ratios. Although a low casting efficiency obviously is bad, its influence on over-all metal loss is not easy to determine. The effect of variations in the poured ratio is even more involved; therefore a technique was devised to simplify calculations. Symbols were assigned to the various materials in process as defined below:

Nomenclature (Pound Units)

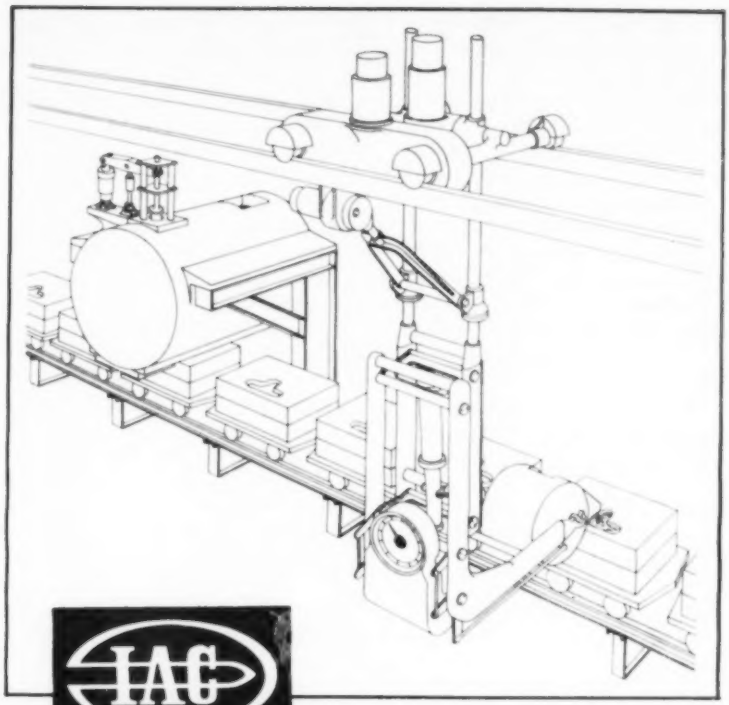
M_i—Alloy ingot melted.

F_i—Flux needed to protect and refine M_i (0.75 – 1.5 per cent).

M_{ii}—M_i lost during melting and refining (0.5 – 1 per cent).

M_s—Metal grain refined or metered.

F_s—Flux needed for M_s (0.5 – 1 per cent).



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M_{sl}—M_s lost during refining or metering (0.5 – 1 per cent).

M_r—Rerun metal.

F_r—Flux needed for M_r (1 – 2 per cent).

M_{rl}—Metal lost melting M_r (1 – 2 per cent).

Nomenclature Continued

M_c—Metal cast.

M_p—Total cast product.

M_f—Finished good product.

M_{cl}—Metal lost in cleaning, grinding, etc. (assumed 1 per cent).

E_c—Per cent casting efficiency = $M_f/M_p \times 100$.

P_r—Poured ratio = M_c/M_p.

Typical Experience Values—(From Paragraph III) F_i = 1.5 per cent; F_r = 2 per cent; F_s = 1 per cent; M_{ll} = 1 per cent; M_{rl} = 2 per cent; M_{sl} = 1 per cent; M_{cl} = 1 per cent. With these values as a base, the material balance chart shown in Fig. 1 was calculated at P_r = 2 and E_c = 80 per cent as follows:

1. Assume M_c = 100,000 lb.
2. $M_p = M_c/P_r$ = 50,000 lb.
3. $M_f = E_cM_p/100 = 80 \times 50{,}000/100 = 40{,}000$.
4. $M_{cl} = 0.01(M_c - M_p) = 500$.
5. M_r = Metal cast – Finished product – Cleaning loss. $M_r = M_c - M_f - 500$. M_r = 59,500 lb.
6. $M_{rl} = 0.02\ M_r$ = 1200 lb.
7. $F_r = 0.02\ M_r$ = 1200 lb.
8. $M_{sl} = 0.01\ M_c$. $M_s = M_c + 0.01\ M_c$ = 101,000 lb.
9. $F_s = 0.01\ M_s$ = 1000 lb.
10. $M_c = M_i + M_r - (M_{ll} + M_{rl} + M_{sl})$

Let $M_{ll} = 0.01\ M_i$

$M_c = 0.99\ M_i + M_r - M_{rl} - M_{sl}$

M_i = 43,130 lb.

M_{ll} = 430 lb.

11. $F_i = 0.015\ M_i$ = 353 lb.
12. Total Sludge = $M_{ll} + M_{rl} + M_{sl} + F_i + F_r + F_s \Rightarrow$ 5,475 lb.
13. ml = $M_{tl}/M_f \times 100$ = 7.83 per cent.
14. fl = $F_t/M_f \times 100$ = 7.1 per cent.
15. sl = $S_t/M_f \times 100$ = 13.7 per cent.

In the same way, other charts were calculated for different poured ratios with the result shown in Fig. 2. It is obvious that plant management should strive to minimize the poured ratio to keep down metal loss, flux usage, and sludge generation.

Casting efficiency is one of the variables having a bearing on the poured ratio. By holding all other conditions constant, one can see how variations of E_c between 60 and 90 per cent change the metal loss figures from 23 to 16 per cent, leveling off at about 15 per cent at E_c = 100 per cent. This permits an estimate of the significance of this variable under a known set of conditions such as the typical experience values used in the example offered. See Fig. 3.

Since work variations may cause appreciable differences in the unit losses incurred, it is desirable to have a quick method available to calculate the effect of one or more significant changes. For example, it may be known that a certain run of castings will increase the loss due to grinding (M_{cl}) from 1 to 3 per cent. We have set up the information on a computer which supplies the desired answers for any given process conditions. Fig. 4 was developed in this manner to show the effect of changing the casting efficiency and/or poured ratio on metal loss. Fig. 5 is a similar graph showing how over-all metal loss increases when the unit losses in each process step are increased by ½ of 1 per cent while E_c = 80 per cent and P_r = 4.

A general question often asked is, "Which variable is the most important one?" The answer depends on the particular circumstances, and the charts are very valuable in this regard once a starting point is known. For example, if a plant is averaging 90 per cent casting efficiency with a poured ratio of 6:1 while using typical melting methods, Fig. 4 shows that achieving 100 per cent casting efficiency will reduce metal loss only from 19 to 17 per cent. On the other hand, metal loss could be cut from 19 to 10 per cent if a 3:1 poured ratio could be achieved with E_c still at 90 per cent.

Fig. 5 brings out the importance of good operating technique in a magnesium plant, where a relatively small increase of ½ per cent in unit losses becomes a significant 5 per cent in over-all loss. Careful control of melting temperatures, surface oxidation, fluxing, sludging, and charging will pay dividends.

Fig. 6 summarizes optimum operating experience under high-volume production conditions with the best known techniques and equip-

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Circle 640 on Page 53

ment. It shows that a sand foundry now operating with $P_r = 4$, $E_c = 70$ per cent, and ml = 17 per cent could improve to ml = 12.5 per cent by better processing methods without altering the P_r and E_c values. A magnesium die casting plant with $P_r = 2$ and $E_c = 90$ per cent should be able to operate with a metal loss of 4 per cent under such conditions.

Conclusions—1. Magnesium sand and diecasting operations can be evaluated by material balance calculations. 2. The relative importance of each variable can be established readily for any given set of conditions, thus indicating the most rewarding areas for process improvement. 3. One should aim to minimize: a. Poured ratio, P_r. b. Metal in sludge. c. Customer "gift metal." d. Sloppy practices in transfer and casting of molten metal. e. Oxidation and contamination during melting. f. Grinding, sanding, and routing. g. The number of containers used. h. Production of scrap castings. i. Time metal is at elevated temperature. 4. One should strive to increase: a. Casting efficiency. b. Volume processed per unit time. c. Mold accuracy.

Plant Maintenance Conference Scheduled for Philadelphia

The 11th annual Plant Maintenance and Engineering Conference will be held Jan. 25-28 in Philadelphia. The Plant Maintenance and Engineering Show, to be held concurrently with the conference, is expected to be the largest in its history; 5 acres of exhibit space will be devoted to the products and services of more than 400 companies.

The conference will feature a program broadly revised to meet changing industrial needs. Ten roundtable discussions will consider the individual problems of particular industries, including foundries. The roundtable program on maintenance in foundries will be held Monday, Jan. 25, at 7:30 p.m. Discussion leader will be S. A. Simonson, plant engineer, Chicago Hardware Foundry Co., North Chicago, Ill.

The conference and show are directed by Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y

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Circle 641 on Page 53

All photographs courtesy of Debevoise-Anderson Co.

Left—Left to right at the luncheon are Ahti A. Erkkinen, conference vice chairman; George M. Rideout, speaker; and William Naughton, luncheon chairman. *Right*—Left to right at the banquet, Prof. Merton C. Flemings, banquet chairman; Nils V. Nelson, speaker; William N. Ohlson, conference chairman; and Fred C. Barbour

NEW ENGLAND CONFERENCE

Considers Both Practice and Theory

By JACK C. MISKE
Associate Editor

● THE 1960 BUSINESS OUTLOOK, labor cost controls, industrial health, and theoretical and practical aspects of ferrous and nonferrous castings production were among topics discussed at the 19th annual New England Regional Foundry Conference, held Oct. 16-17 at Massachusetts Institute of Technology, Cambridge, Mass.

The conference was opened by William N. Ohlson, Draper Corp., Hopedale, Mass., conference chairman. Mr. Ohlson introduced Gordon Brown, dean of engineering at MIT, who welcomed those in attendance and expressed his hope that MIT and New England foundrymen would continue their co-operative activities.

Ahti A. Erkkinen, Fremont Casting Co., Worcester, Mass., conference vice chairman and chairman of New England Chapter, AFS, and Henry G. Stenberg, Draper Corp., and regional director, AFS, welcomed the group on behalf of the American Foundrymen's Society.

Ferrous and nonferrous chairmen were, respectively, John F. Dwyer, Shell Process Inc., West Springfield, Mass., and Stafford W. Chappell, General Dynamics Corp., Groton, Conn.

Importance of Labor Cost Controls—George E. Meyers, management consultant. Management needs to get the highest possible return for its wage dollar. The first need is to know real labor costs, which are not necessarily money spent for wages. Ordinarily, effective production of day workers can be increased up to 50 per cent.

One system which shows labor costs and can be used to increase production involves setting up standard labor costs on a historical basis. It requires establishing base period costs—average costs for six months—which are used as a measuring stick. The system requires considerable detail but costs only about 15 per cent of the savings it makes possible.

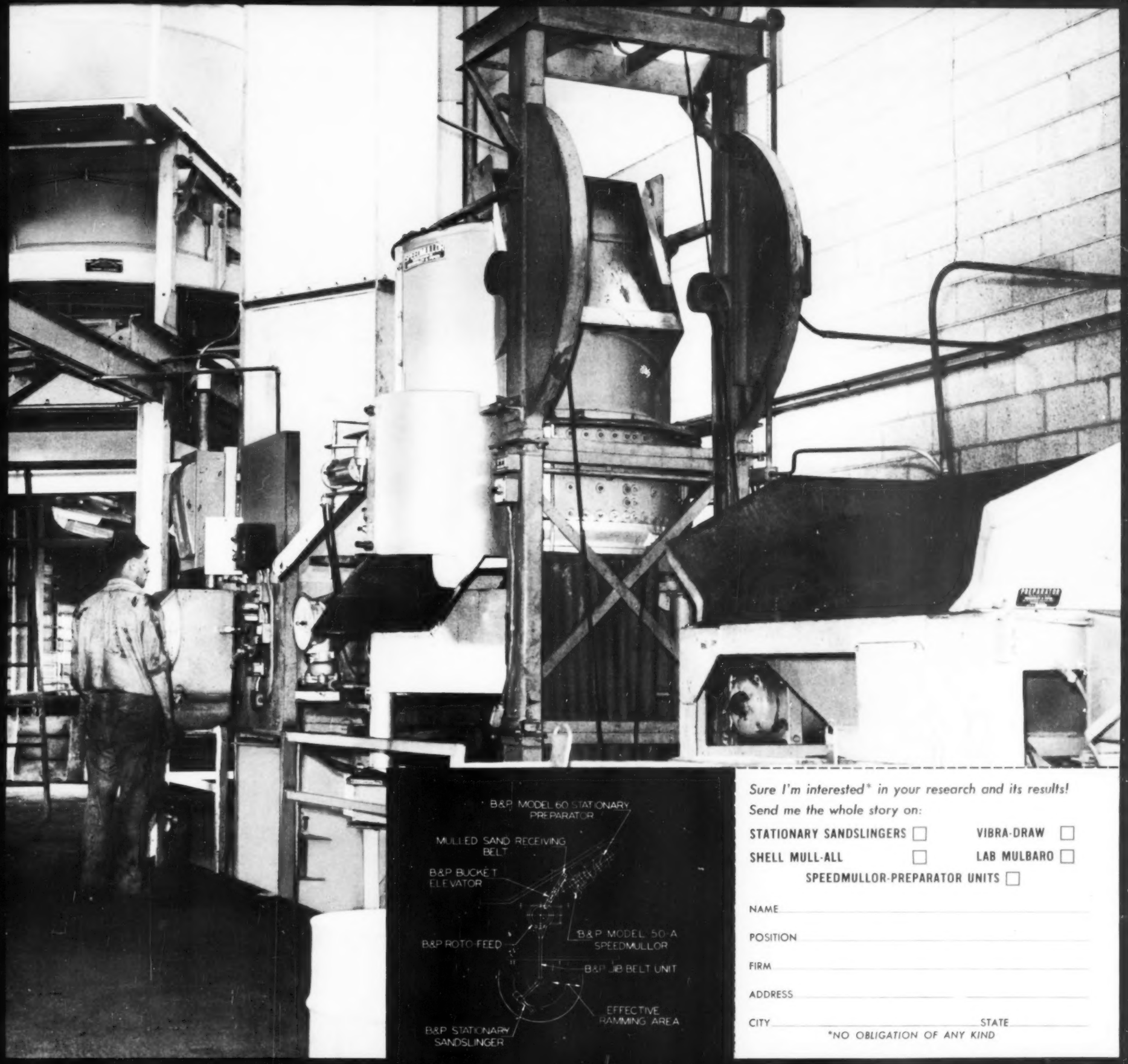
Business Outlook for 1960 — George M. Rideout, vice president, Babson's Reports Inc., Wellesley, Mass. The 1960s will be a period of unparalled prosperity because of the convergence of five factors: 1. Population growth. 2. Automation and increased obsolescence. 3. Increased research and development. 4. Transportation advances which will necessitate large roadbuilding programs. 5. Redistribution of income to the constantly enlarging middle class.

Nickel and the Nonferrous Alloys —G. L. Lee, metallurgist, International Nickel Co., New York. Copper-base alloy products are riding a downtrend, losing ground to other metals and other materials. Improved alloys may offer one means of reversing this trend, and increased nickel contents in many alloys can provide better properties and wider range of applications. Producers of castings will have to make constantly more complex parts which will require increasingly strict controls.

Ductile Iron — Production and Control Techniques — Harvey E. Henderson, project engineer, Lynchburg Foundry Co., Lynchburg, Va. Lynchburg began production of ductile iron in 1949. Iron is melted in acid-lined, watercooled cupolas. Metal is desulfurized to less than 0.02 per cent sulfur by calcium carbide injection in the front-slagging trough. Average analysis is 1.10 per cent Si, 0.30 per cent Mn, 0.064 per cent P, and 3.60 total C. Composition must be rigidly controlled to make ductile iron with consistent as-cast properties.

Greatest single factor in successful casting of as-cast ductile iron is maintenance of the correct relationship between sulfur, magnesium, and cerium in the iron. Lynchburg's control is based on fast, accurate analysis of sulfur and exact additions of magnesium and cerium on the basis of that analysis. Chief metallurgical problems with as-cast ductile

Circle 642 on Page 53→



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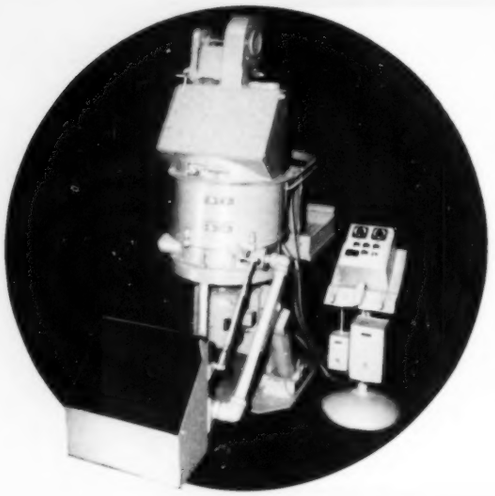

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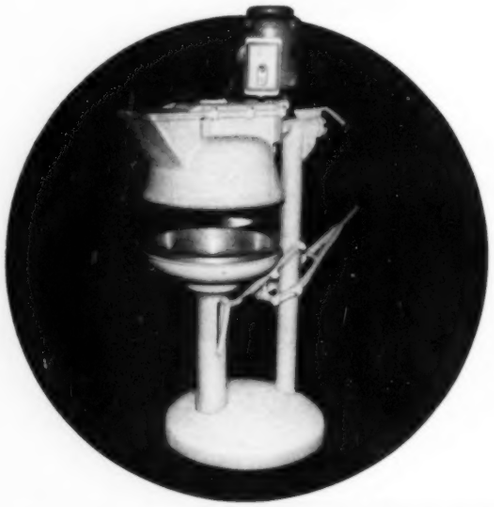

New Low Cost Lab Unit Improves Sand Control

New plow design, scientifically contoured mulling bowl, and rubber-tired mulling wheels assure thoroughly mulled sand batches which very closely duplicate molding and core sand mixtures prepared by production Speedmullors. The Lab Mulbaro provides close laboratory control of sand preparation and permits practical, low cost experimentation with the many new binders. Mulltrol is available for batch after batch uniformity through precise control of the mulling cycle. Lab Mulbaros quickly pay for themselves through improved sand control, improved sand properties and the ensuing improvement in casting quality.

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iron are massive carbides and wormy graphite. Lynchburg is installing a plunging method of adding magnesium alloy which, it is hoped, will cut alloy costs by at least 25 per cent.

Occupational Diseases in Foundrymen — Fact and Fallacy — H. J. Weber, director of safety, hygiene, and air pollution control, AFS. Many misconceptions are prevalent concerning occupational diseases. Infrared radiation, for example, never has been proved to be a cause of cataracts, although it often has been so called. A radiation injury problem which is real is posed by the use of radioisotopes. These materials are finding increasing applications in the foundry industry in inspection, sand and mold testing, cupola level indicators, and others.

Silicosis also is exaggerated as a danger in foundries. Its occurrence requires long exposure to free crystalline silica. It often is confused with siderosis, which is a pigmentation of the lungs caused by iron deposits, because it looks the same on an x-ray. Beryllium-copper alloys require careful handling, for the fumes can cause death, as can lead in all its forms.

Recent Developments in the Melting Operation — Fred C. Barbour, Republic Steel Corp., Cleveland. Recent developments include an exhaust hood for electric furnaces which collects all fumes and oxides and conveys them through a flexible hose to a dust collector. A new procedure for reducing the sulfur content of iron melted in acid-lined cupolas uses a hopper or container situated close to the cupola and above the tuyeres. Dense soda ash or a combination of soda ash and calcium carbide is fed from the hopper into a tube or pipe projecting horizontally into one of the tuyeres.

Still another innovation is a simple hot blast installation for small cupolas which employs a series of vertical tubes. These are connected to the windbox, which is just below the charging door of the cupola and projects to the tuyere area inside the shell. It is reported to achieve a high melting rate.

Aluminum Casting Quality Control — D. L. LaVelle, American Smelting & Refining Co., South Plainfield, N. J. It is believed that internal casting defects due to causes of a metallurgical nature can be classified into two types with five basic categories: 1. *Nonmetallic inclusions.* This group includes dross and oxide hard spots, usually encountered during cleaning, and flux inclusions, caused when metal is poured before flux has separated from it. 2. *Porosity.* This classification covers trapped air in metal, hydrogen in metal, and shrinkage which results from improper gating, risering, or chilling practices.

What Alloys Can Do for the Small Iron Foundry—David Matter, Ohio Ferro-Alloys Corp., Canton, Ohio. Gray iron is extremely sensitive to section size. Successful pouring of a suitable iron depends on chemistry and cooling rate. Normally, the foundryman wants Class A structure—mostly pearlite with a random distribution of graphite. Graphite control is the prime consideration in relation to properties desired; shape and distribution of the graphite are more important than volume since the material has no strength itself.

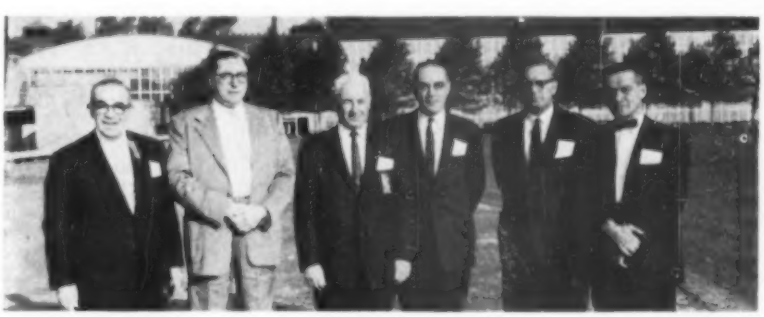
Inoculation is a most convenient tool for shops which must pour a variety of sections from one melt. The process ordinarily consists of the addition of graphitizing agents to the ladle after metal has left the cupola. It produces effects not directly traceable to composition. The most common of these agents is ferrosilicon, used in the coarsest size which will go into solution.

Obtaining Physical Properties of Aluminum Bronze and Aluminum Manganese Bronze — Raymond D. Turner, General Dynamics Corp., Electric Boat Div., Groton, Conn. Faced with the problem of consistently obtaining desired mechanical properties in aluminum and aluminum manganese bronzes, Electric Boat Div. sought a method of better control of its alloys. Goal was to establish some quick method to control metal in the furnace and when it was poured. Tests established pouring temperatures, Brinell hardness ranges, and proper amounts of additions to alloys. Losses of both time and money have been reduced greatly.

Gating and Risering of Ferrous Castings—Prof. John F. Wallace, Case Institute of Technology, Cleveland. See FOUNDRY, October and November, 1959, p. 74 in each issue.

The Sands of Time Await No Man—Kurt A. Miericke, Baroid Chemicals Inc., Chicago. The man at the muller is one of the most important factors in the production of good, workable sand. His importance usually is overlooked, and he is not selected carefully enough or trained properly. To produce good sand, he must measure accurately, keep the muller and measuring cans clean, spread binders over sand, and maintain proper mulling time. He should take pride and interest in his job, learn about the materials used, and keep his equipment in good condition.

General suggestions for producing better sand include the following: 1. Work sand as dry as possible. 2. Keep clay content as low as possible. 3. Avoid buildup of excess inert fines in the system. 4. Control ash content in sand. 5. Reduce riddling to a minimum. 6. Avoid overhandling sand. 7. Avoid heavy additions of new sand. 8. Avoid long mulling and unnecessary sand movement. 9. Develop a regular mulling routine and follow it. 10. Test regularly for permeabil-



Among those whose work made the conference a success were, left to right, Herbert H. Klein, William N. Ohlson, John H. Orrok, Stafford W. Chappell, Henry G. Stenberg, and Ahti A. Erkkinen

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ity, green strength, and moisture.

Speaker at the conference banquet was Nils V. "Swede" Nelson, who discussed his many years in sports activities.

New Jersey Zinc Co. Sponsors Zinc Diecasting Competition

The New Jersey Zinc Co. has announced a cash awards competition for the best examples of lightweight, thin-walled zinc diecastings used in product design. The awards will be made to the designer of the casting in the company which uses the diecasting in its product.

Purpose of the contest is to stimulate interest in imaginative and progressive use of zinc diecastings in the design or redesign of both industrial and consumer products. Entries must be of unusually lightweight construction. They will be judged on over-all efficient utilization of advantages of the diecasting process combined with the casting and mechanical properties of zinc alloys.

First, second, and third awards will be $200, $100, and $50, respectively. Details and entry blanks are available from "Lighter Than You Think" Contest Editor, New Jersey Zinc Co., 160 Front St., New York 38, N. Y. Deadline is Jan. 31, 1960.

Issues Fire Prevention Aid

A handbook on industrial fire prevention and protection has been published by the Office of Technical Services, U. S. Department of Commerce, Washington 25.

Prepared by the Navy's Bureau of Yards and Docks for use of its personnel, it covers basic fire prevention measures including requirements for construction, emergency and protective features, and safeguards against common hazards. In addition to the more common fire hazards, such special hazards are discussed as chemicals and metals, welding and cutting operations, surface finishes, plastics, electricity, inflammable liquids and gases, dust explosion, and woodworking.

The publication is PB 151695, Fire Prevention and Fire Protection, Bureau of Yards and Docks, U. S. Navy, 190 pages. It may be ordered from OTS. Price is $3.

Circle 643 on Page 53

A 3M Case History Report

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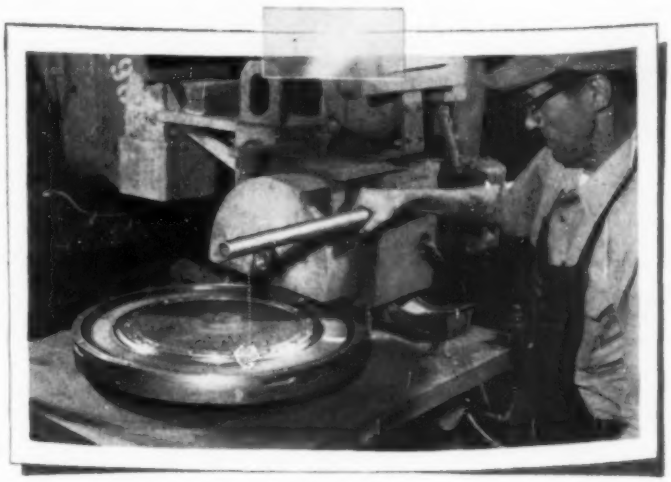

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Literature for Foundrymen

For More Information Use Reply Card—Page 53

Industrial Trucks

Complete truck line is illustrated in an 8-page brochure listing dimensions, performance data, and equipment specifications. Featured is a table listing options, attachments, and accessories available.—**Hyster Co.**, P. O. Box 847, Danville, Ill.

For More Details Circle No. 406—Page 53

Instrumentation and Control

Illustrated, condensed Catalog 59-CO91 (297) describes pressure, flow, temperature, level, and gas analysis instruments, all-electric combustion control systems, and receivers.—**Hays Corp.**, 742 E. Eighth St., Michigan City, Ind.

For More Details Circle No. 407—Page 53

Adjustable-Speed Drives

Twelve-page Bulletin D-2507 presents detailed performance and application data on the company's complete line of all-electric, adjustable-speed V*S Jr. drives. Condensed specifications, dimensions, and a gearmotor section table are given.—**Reliance Electric & Engineering Co.**, 24701 Euclid Ave., Cleveland 17, Ohio.

For More Details Circle No. 408—Page 53

Proportioning Systems

Forty-eight-page Catalog 941 presents the company's line of equipment for weighing, batching, and proportioning systems. Applications, specifications, installation, and operation are detailed. Photos, drawings, and charts illustrate the booklet. —**Jeffrey Mfg. Co.**, 907 N. Fourth St., Columbus 16, Ohio.

For More Details Circle No. 409—Page 53

Ultrascopic Safety Glasses

Catalog S-8582 describes company's complete line of Ultrascopic safety glasses. —**Safety Products Div., American Optical Co.**, Southbridge, Mass.

For More Details Circle No. 410—Page 53

Castable Refractory

Facts on how to select and properly use Kromform, the company's dry air-setting chrome ore castable refractory are presented in Bulletin 72. — **Refractories Div., H. K. Porter Co.**, Porter Bldg., Pittsburgh 19, Pa.

For More Details Circle No. 411—Page 53

Carbon Dioxide Welding

Booklet EW-208 describes Migarc welding, the company's metal, inert gas-shielded, arc process. Booklet includes comprehensive information on equipment, power sources, and many other factors of the technical and practical aspects of CO_2 welding and their applications to a wide variety of industries.—**Hobart Bros. Co.**, Troy, Ohio.

For More Details Circle No. 412—Page 53

Pins and Bushings

Catalog 211 pictures and describes company's entire line of pins, bushings, guides, and miscellaneous parts for flasks and pattern plates. Pattern department data and complete price lists also are included.—**Hines Flask Co.**, 3431 W. 140th St., Cleveland 11, Ohio.

For More Details Circle No. 413—Page 53

Standardization of Molds

Standards for plastic injection and compression molding and zinc and aluminum die casting are shown in a folder. Each product is photographed. An edition of the company's news folder listing prices and specifications accompanies the standards folder.—**Detroit Mold Engineering Co.**, 6686 E. McNichols Rd., Detroit 12, Mich.

For More Details Circle No. 414—Page 53

Hydrostatic Instrumentation

Pocketsized, 88-page handbook contains information on the principle of hydrostatic measurement, selection and installation of instruments, design and construction of panel systems, and 26 pages of engineering data and diagrams. Company's complete line of instruments is described.—**Petrometer Corp.**, 43-22 Tenth St., Long Island City 1, N. Y.

For More Details Circle No. 415—Page 53

Abrasive Wheels

Fifty-seven page specifications catalog lists abrasive wheel recommendations for grinding everything from agate to zirconium — **Carborundum Co.**, Niagara Falls, N. Y.

For More Details Circle No. 416—Page 53

Melting Pots

Illustrated data sheet contains specifications on line of standard heat-resistant alloy iron diecasting melting pots available from stock. Special pots made to order.—**Tiffin Foundry Inc.**, W. Adams St., Tiffin, Ohio.

For More Details Circle No. 417—Page 53

Finishing Systems

Form F-325 is an illustrated index of the company's finishing equipment. The folder describes each unit and includes information on the firm's customer research laboratory. — **DeVilbiss Co.**, 300 Philips Ave., Toledo 1, Ohio.

For More Details Circle No. 418—Page 53

Foundry Supplies

Catalog 460 presents data on the company's full line of core binders, resins, facings, bentonite, washes and blackings, and other foundry supplies. — **Federal Foundry Supply Div., Archer-Daniels-Midland Co.**, 2191 W. 110th St., Cleveland 2, Ohio.

For More Details Circle No. 419—Page 53

Air Supply Line Accessories

Air supply line accessories such as sockets, plugs, hose clamps, fittings, and tools are illustrated and described in Catalog 227.—**Industrial Div., Lincoln Engineering Co.**, 4010 Goodfellow Blvd., St. Louis 20, Mo.

For More Details Circle No. 420—Page 53

Jib Cranes

Square column jib cranes are shown in Bulletin 405-A. Specification views, installation photographs, and data on dimensions are included.—**Industrial Div., R. G. LeTourneau Inc.**, Longview, Texas.

For More Details Circle No. 421—Page 53

Tool Steel

Premo tool molds for plastic and diecasting dies for zinc and other metals with low melting points are described

Did You Miss These?

Here is a list of popular literature items offered in recent months

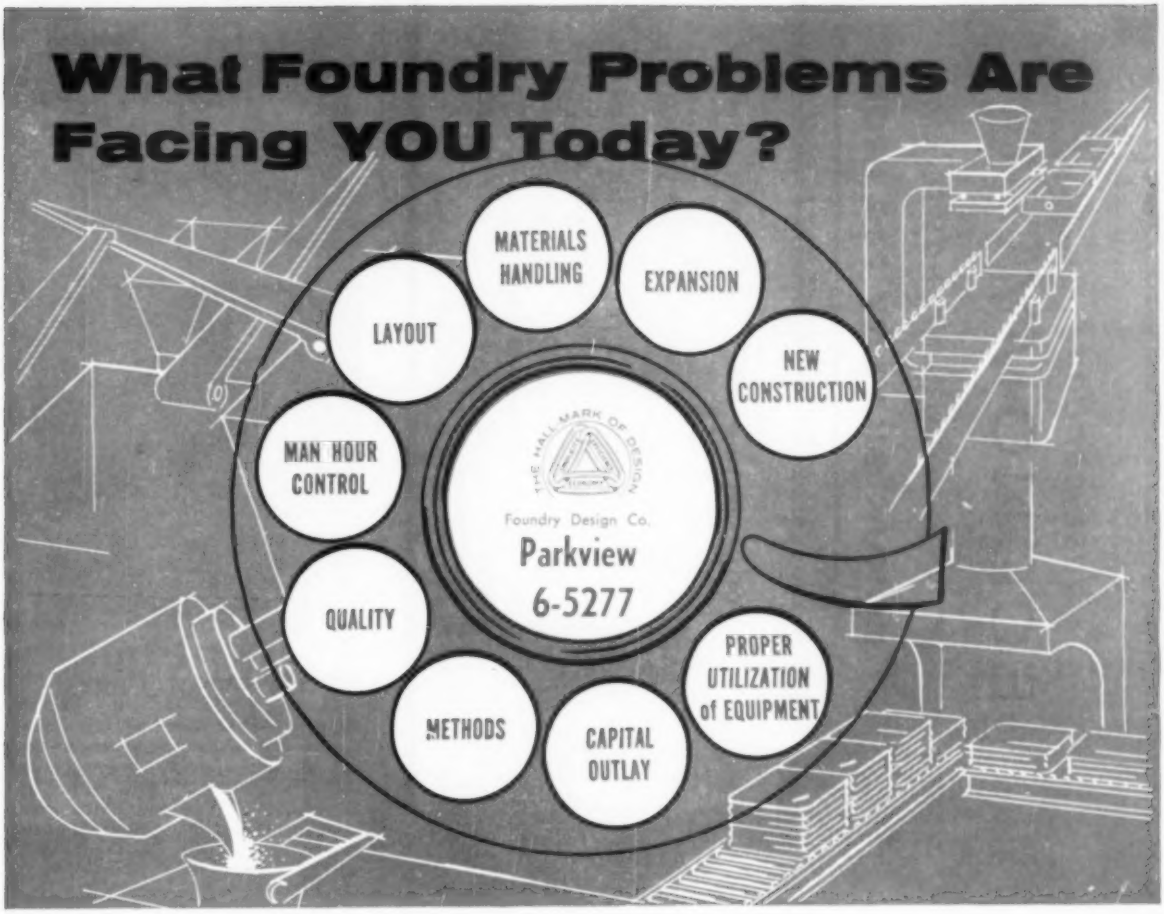
MANAGEMENT INFORMATION — Elliott Service Co., Mount Vernon, N. Y. Circle 401, Page 53

MOLYBDENUM IN GRAY IRON (Bulletin 8) — Climax Molybdenum Co., division of American Metal Climax Inc., New York 36, N. Y. Circle 402, Page 53

INCENTIVE PLAN — Eddy-Rucker-Nickels Co., Cambridge 38, Mass. Circle 403, Page 53

REFRACTORY PRODUCTS (Refractories Handbook)—Walsh Refractories Corp., St. Louis 7, Mo. Circle 404, Page 53

DUCTILE IRON—Ohio Ferro-Alloys Corp., Canton 9, Ohio. Circle 405, Page 53



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Let us arrange for you to visit any of the companies who have availed themselves of our service.

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Circle 645 on Page 53

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The Keokuk trio has a way of beating costs. While the Chief plants a dime in the turnstile, Junior and Princess Wenatchee go through gratis.

in this pamphlet, which also gives informative charts on carburizing time and tempering temperature.—**Uddeholm Co. of America,** 155 E. 44th St., New York 17, N. Y.

For More Details Circle No. 422—Page 53

Blast Cleaning

Booklet called "Facts of Life Concerning the Use of Shot and Grit" covers blast cleaning functions, materials, progress and research achievements in the

manufacture of shot and grit, housekeeping practices, and other information.—**National Metal Abrasive Co.,** 3560 Norton Rd., Cleveland 11, Ohio.

For More Details Circle No. 423—Page 53

Safety Products

Catalog A-1762 lists the company's complete line of safety products for industrial and laboratory job requirements. Its 40 pages include descriptions of glasses, goggles, eye shields, lenses, and information on vision-testing instruments. —**Safety Products Dept., Bausch & Lomb Optical Co.,** 635 St. Paul St., Rochester 2, N. Y.

For More Details Circle No. 424—Page 53

Fork Lift Trucks

Pictorial review of FT series fork lift trucks contains illustrations and descriptions to show engineering, design, construction, and operating features of the trucks. The 16-page booklet is BU-451A. —**Engine-Material Handling Div., Allis-Chalmers Mfg. Co.,** Milwaukee 1, Wis.

For More Details Circle No. 425—Page 53

Metal Treatment

Ospho, company's metal treatment, is described in Form No. 16. Diagrams show how to use the product.—**Rusticide Products Co.,** 3125 Perkins Ave., Cleveland 14, Ohio.

For More Details Circle No. 426—Page 53

CO_2 Process

Bulletin covers products for use in the CO_2 process. They include binder, core paste, core and mold wash, mudding compound, carbon, and sand conditioner.—**Frederic B. Stevens Inc.,** 1800 18th St., Detroit 16, Mich.

For More Details Circle No. 427—Page 53

Machine Systems

Manual KD 854 explains visible record keeping systems and housing equipment. Twelve-page manual contains detailed il-

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The water you use in (1) sand conditioning, (2) core and mold washes, (3) cupola linings, and (4) CO_2 core cleaning has greater penetration and dispersion when conditioned in the simple AQUADYNE way, thus...

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Circle 647 on Page 53

If you're troubled with gas porosity, oxides or poor fluidity in iron castings, try

Foseco FERROGEN
scavenging compound

This bulletin gives the details. Send for your free copy today.

Foseco
FOUNDRY SERVICES, INC.
P. O. Box 8728, Cleveland 35, Ohio

Circle 648 on Page 53

lustrations.—**Remington Rand Div., Sperry Rand Corp.**, 315 Fourth Ave., New York 10, N. Y.

For More Details Circle No. 428—Page 53

High-Level Circulators

High-level circulating units for redistributing air are described in 4-page Bulletin HLC-59. Features and engineering data on units are covered.—**L. J. Wing Mfg. Co.**, division of Aero Supply Mfg. Co., 140 Vreeland Mills Rd., Linden, N. J.

For More Details Circle No. 429—Page 53

Safety Starters

Six important safety features of the company's Type L combination safety starters are discussed in Booklet B-7322. Specifications and a diagram of the starters are included.—**Westinghouse Electric Corp.**, P. O. Box 2099, Pittsburgh 30, Pa.

For More Details Circle No. 430—Page 53

Measuring Tools

Precision measuring tools and instruments are completely detailed in Catalog

25. The 96 pages contain many illustrations and an alphabetical index to the catalog.—**Scheer-Tumico**, 200 Lafayette St., New York 12, N. Y.

For More Details Circle No. 431—Page 53

Diecasting Machines

Bulletin explains features and specifications of the company's zinc, aluminum, magnesium, and brass diecasting machines.—**American Die Casting Machinery Co.**, 1516 W. Thomas St., Chicago 22, Ill.

For More Details Circle No. 432—Page 53

Finishing Machine

Company's precision finishing machine is the subject of a four-page brochure. Specifications, diagram illustrating action of the machine, and case histories are included.—**Roto-Finish Co.**, 3700 Milham Rd., Kalamazoo, Mich.

For More Details Circle No. 433—Page 53

Exhaust Hoods

Various exhaust hoods for operations common to foundries are illustrated in Bulletin 270-E2A, Vol. 2. The 28-page manual covers shakeout, melting, sand handling, finishing and conditioning in-

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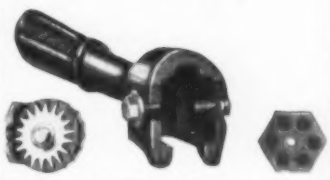

Desmond Hex Dresser

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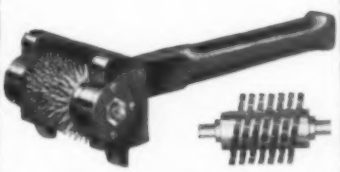

Desmond Heavy Duty Dresser

DRESSERS

Cut grinding and snagging costs with inexpensive Desmond Hex dressers. They bring grinding wheel faces to "new" efficiency by removing loaded metal and exposing sharp abrasive grains. And Hex dressers provide six sets of bearings in one set of bearing blocks . . . for extra life on average wheels. For resinoid and rubber bonded high-speed wheels use the ball-bearing Desmond Heavy Duty Dresser. Ask your Desmond distributor's advice.

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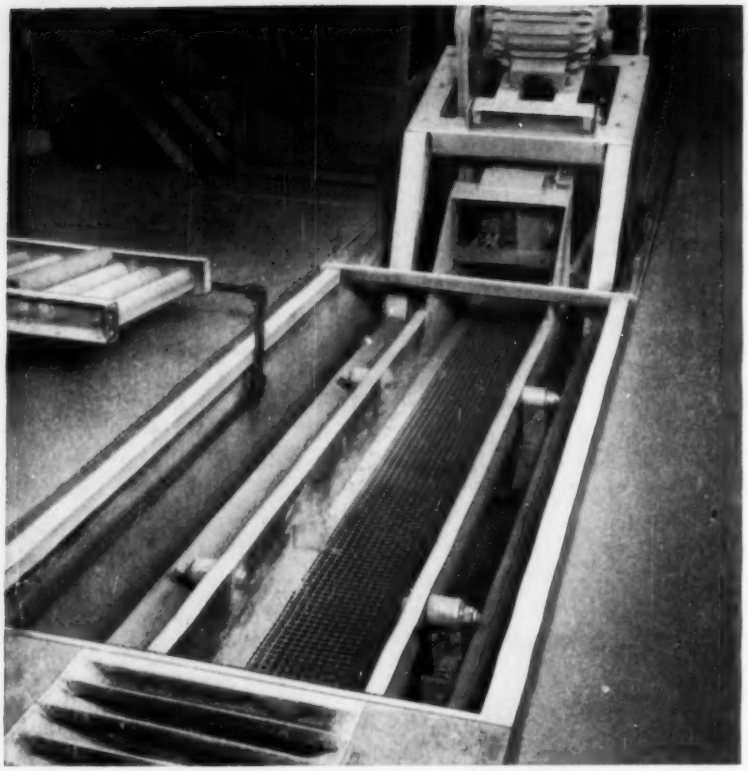
Urbana, Ohio

Circle 649 on Page 53



Photograph shows Ajax Lo-Veyor installed below floor. Floor grids similar to those shown in foreground have been removed to show arrangement of conveyor pan with screen.

AJAX Vibrating Conveyors
Cut Screening and Handling Costs
in Large and Small Foundries

With today's skyrocketing costs, the importance of reducing non-productive expense was never more urgent. Large and small foundries are saving money by conveying sand with Ajax Lo-Veyors.

Photograph shows part of a complete Ajax Lo-Veyor installation in a bronze foundry. Molds are dumped on floor grids at the end of each of ten pouring lines. Large lumps, core butts, and refuse are screened from the sand while being conveyed to the reconditioning system.

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Learn how Ajax Vibration Engineering Service can help you cut your costs. Phone, write, or send coupon for your copy of this helpful book.

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Circle 650 on Page 53

stallations. — **American Air Filter Co.**, Dept. PD, 215 Central Ave., Louisville 8, Ky.

For More Details Circle No. 434—Page 53

Flexible Shaft Equipment

Catalog 59 describes company's flexible shaft equipment and other tools including variable speed and transformer-type flexible shaft grinders. — **Wyzenbeek & Staff Inc.**, 223 N. California Ave., Chicago 12, Ill.

For More Details Circle No. 435—Page 53

Overhead Handling Systems

Bulletin C-2 features company's systems of track, cranes, trolley, switches,

and other electrification, as well as monotractors and auxiliary equipment. The 56 pages also list applications in many industries.—**American MonoRail Co.**, 1111 E. 200th St., Euclid, Ohio.

For More Details Circle No. 436—Page 53

Lift Truck Designs

"The Inside Story" is a 24-page booklet that deals with design features of new "Pace-Maker" fork lift trucks. A centralized system of lift truck control is outlined in this booklet, SP-23.—**Towmotor Corp.**, 1226 E. 152nd St., Cleveland 10, Ohio.

For More Details Circle No. 437—Page 53

Mercury Lamps

Bulletin LS-103 contains technical data on mercury lamps and ballasts, their physical and operating characteristics, ordering designations and prices.—**Large Lamp Dept. General Electric**, Nela Park, Cleveland 12, Ohio.

For More Details Circle No. 438—Page 53

Furnace and Oven Controls

Forty-page Bulletin B43-1C gives information, illustrations, and prices of the company's furnace and oven controls.—**Industrial Div., Minneapolis-Honeywell Regulator Co.**, Wayne and Windrim Avenues, Philadelphia 44, Pa.

For More Details Circle No. 439—Page 53

Car Bottom Furnaces

Bulletin HD 644R covers uses, construction features, design, and applications of electric car bottom furnaces.—**Hevi-Duty Electric Co.**, 4210 Highland Ave., Milwaukee 1, Wis.

For More Details Circle No. 440—Page 53

Specify the

T-J Spacemaker

for longer, more efficient cylinder service

You too—can reduce replacement expenditures—lower maintenance costs with the T-J Spacemaker cylinder line. Designed and engineered for ruggedness, and accuracy of operation, the Spacemaker assures longer, uninterrupted operation.

The T-J Spacemaker eliminates tie-rods, gives greater strength, saves space . . . and reduces costs in all push-pull operations. Immediate delivery in a complete range of styles and capacities . . . air or oil. Write for Bulletin SM 155-4, today. The Tomkins-Johnson Company, Jackson, Michigan.

With Extras . . . At No Extra Cost

1. METAL PISTON ROD SCRAPER—protects rod packing, cylinder bore and rod surface by removing all foreign particles.
2. NEW "SUPER" CUSHION for air or METALLIC SELF-ALIGNING MASTER CUSHION for oil.
3. HARD CHROME PLATED CYLINDER BORES AND PISTON RODS for greater protection and reduced wear.
4. ONE PIECE PISTON assures better alignment, longer bearing and packing life.
5. FORGED SOLID STEEL HEADS throughout entire line.
6. PILOTED PACKING GLAND with extra long bearing for additional strength and support to piston rod.
7. NO TIE-RODS TO STRETCH—gives you 360° port rotation . . . less space used . . . full strength.
8. STREAMLINED DESIGN . . . operating pressures to 200 PSI, air; 1,000 PSI oil, non-shock.

T-J TOMKINS-JOHNSON

RIVETORS . . . AIR AND HYDRAULIC CYLINDERS . . . CUTTERS . . . CLINCHORS

Circle 651 on Page 53

Conference banquet was held on the evening of the first day of the meeting

Operating Practice Chief Topic at

PURDUE CONFERENCE

By ERLE F. ROSS

● MELTING PRACTICE, mold and core production, and applications for castings headlined topics at the 12th annual Metals Casting Conference at Purdue University, West Lafayette, Ind., Oct. 29-30. The program provided discussions on shop practices as well as metallurgical and supervisory considerations.

The conference was sponsored by the university's School of Metallurgical Engineering and Division of Adult Education in co-operation with the Michiana and Central Indiana Chapters of the American Foundrymen's Society. Registered attendance was approximately 165, exclusive of students in metal processing classes.

Dallas F. Lunsford, chief metallurgist, Perfect Circle Corp., Hagerstown, Ind., was conference general chairman. After calling the conference to order, he introduced John W. Hicks, assistant to the president of Purdue University, who extended the university welcome.

Conference response to the university welcome was made by Richard R. Deas Jr., AFS regional vice president and vice president and works manager, Hamilton Foundry Inc., Hamilton, Ohio. Mr. Deas asserted that "along with most all other lines of endeavor, the foundry industry is being called upon to keep pace with the increased tempo and the changing requirements of the time." The speaker emphasized that to meet this challenge, the foundryman must take advantage of the educational opportunities available within the industry. Specifically, he mentioned the AFS Technical and Research Institute, conferences and chapter meetings; the Foundry Educational Foundation program; and articles in the technical press.

Howard B. Voorhees, manufacturers agent, Mishawaka, Ind., was conference program chairman, and Thomas E. Smith, production manager, Central Foundry Div., General Motors Corp., Danville, Ill., was assistant program chairman. The technical program consisted of eight sessions, one of which featured a panel discussion.

Practical Application of the CO_2 Process, by William E. Jones, project engineer, Lester B. Knight & Associates, Chicago—presented in absentia by Sam Hodler, Golden Foundry Co., Columbus, Ind. Chief merit of the CO_2 process is its ability to harden the sodium silicate between the sand grains in 8 to 15 seconds, and form a core or mold that will receive the metal and produce a salable casting with acceptable tolerances and finish at a reasonable cost.

Binder cost is approximately three times that of an average oil sand mix, but this extra cost is more than offset by elimination of baking and related multiple handling. Variances in the weight of castings usually can be attributed to lack of mold hardness.

Advantages of sodium silicate bonded cores and molds are: Increased metal yield of risers versus green sand; excellent detail and dimensional qualities; uniform weight of castings by less wall movement; faster customer delivery and scheduling; knife gating works well with this type of dry sand as the gates can be thinner; better control of solidification practice; elimination of green topping or pasting of large cores; faster pouring time in dry sand; increased coremaking capacity; elimination of core driers and

What does the average foundryman say when he rub-tests samples of

CEDAR HEIGHTS *air floated clay?*

He usually exclaims:

SOFT AS VELVET!

FINE AS FLOUR!

LIGHT AS AIR!

The high quality of CEDAR HEIGHTS processed clays is assured by close laboratory control. It's a matter of superior raw materials in the beginning, and careful attention through mining, screening, grinding and packaging afterward. Bonding clays and fire clays for all foundry needs can be delivered in a hurry at very attractive prices. Let us give you the name of your nearest dealer.

Ask your distributor or write to us direct for free samples of our products.

CEDAR HEIGHTS CLAY COMPANY

50 PORTSMOUTH ROAD
OAK HILL, OHIO

Circle 652 on Page 53

plates; less danger of green centers in cores; cores do not have to be baked; cores are available for immediate use.

The process is in no way a remedy for bad foundry practice but it may aid in solving practical foundry problems if equal thought and experience is exercised in its usage.

Melting of Copper-Base Alloys, by Fred L. Riddell, foundry metallurgist, H. Kramer & Co., Chicago. First requisite in melting is selection of type of furnace. Considerations in this selection are: 1. Quality of the metal. 2. Working conditions. 3. Investment and operating costs. 4. Flexibility. 5. Maintenance cost. 6. Operating skill.

The metal making up the charge must be of highest quality and the furnace must deliver it at the spout without impairment of its quality. Furthermore, the charge metal must be clean and free of oil. Pouring temperature was discussed and it was pointed out that the danger is mostly on the high side.

Carbon Control in Acid Cupola Operation, by Wally Levi, consultant, Radford, Va. Good carbon control is one of the requirements of quality control. In most ordinary irons, carbon is the most important element, having three times as much influence on physical and mechanical properties of the metal as either silicon or phosphorus.

Once the iron has been tapped, it is relatively difficult to raise the percentage of carbon as compared, for example, with increasing the silicon content by a late addition, although it is being done successfully in a number of foundries by continuous graphite injection.

The percentages of silicon and phosphorus in the iron at the cupola spout have an important bearing on carbon pickup during melting. To make a reasonably close estimate of the carbon at the spout, the percentages of the two elements and percentage of carbon in the charge must be known. This, of course, requires a knowledge of the composition of the metallic components of the charge. Once the charge has been calculated, each component must be weighed carefully.

Gas and Its Control in the Casting of Aluminum, by D. L. LaVelle, chief of aluminum research and development, Central Research Laboratories, American Smelting & Refining Co., South Plainfield, N. J.

In sand and permanent mold castings there is a growing realization of the importance of gas at or below the pinhole level in controlling shrinkage. Completely degassed aluminum, although desirable for castings of the highest quality, gives problems with shrinkage and is not necessary for good quality commercial castings.

The quantity of gas in melts is most commonly estimated from a small liquid sample which is solidified in a moderate vacuum of about 27 in. Hg. Gas content may be deduced from observation of the sample surface, by the number and size of the holes visible on a cross section, or by means of the specific gravity of the specimen. An instrument is also available which reads the gas contents of melts directly. Appearance of the specimen is related to casting quality by a series of simple comparisons and a standard is selected.

Many foundries have discovered that control of combustion in fuel-fired furnaces gives adequate control of gas content. The addition of gas in controlled amounts is more difficult. Fluxes are available for this purpose, and on a batch basis almost any moisture containing material may be plunged into the melt. Such methods, however, are difficult to control, dross is generated and the gas introduced is dissipated quickly. A more satisfactory method of adding gas has been patented which consists of bubbling hydrogen through a melt at a controlled rate to introduce controllable quantities of gas suitable for the job at hand.

Metallurgy of Malleable Iron and Future Uses, by William Truckenmiller, assistant technical director, Albion Malleable Iron Co., Albion, Mich. Topics discussed included the melting operation, and effects of charge materials, including graphitic materials which contribute to mottling tendency, and the need for minimum alloy content, particularly with respect to carbide stabilizing elements such as chromium and vanadium.

Other subjects were the annealing operation, including type of equipment generally employed, the heat treatment of pearlitic malleable iron, and the relationship of nodule count to mechanical properties.

A low nodule count, as evidenced by the presence of few large particles of temper carbon, produces long paths for diffusion of carbon during the second stage of the annealing operation and inhibits rapid annealing. On the other hand, a large number of fine temper carbon particles results in low mechanical properties. An intermediate nodule count of 70 to 90 particles per 20 sq in. at 100 diameters appears to be about optimum.

Applications for Aluminum Castings in the Automotive Industry, by

Conference committee: Left to right, front, H. A. Montgomery, Purdue; J. C. Maggart, Sibley Machine & Foundry Corp.; C. T. Marek, Purdue; H. B. Voorhees, program chairman; and D. F. Lunsford, Perfect Circle Corp., general chairman. Back row, left to right, P. M. Semler, Auto Specialties Mfg. Co.; K. E. Glancy, Purdue; J. B. Essex, Golden Foundry; Reinhardt Schuhmann Jr., Purdue; and W. M. Fitzsimmons, International Harvester Co.

Robert F. Thomson, head, metallurgical engineering department, Research Laboratories, General Motors Corp., Detroit. Use of aluminum per car has risen from 2 lb prewar to 57 lb in 1959, but extent of future expansion will depend on a number of factors.

Developments awaited include better quality diecastings, decreased heat treating cycles, improved core materials and mold materials for semipermanent mold castings, and improved and cheaper diecasting dies.

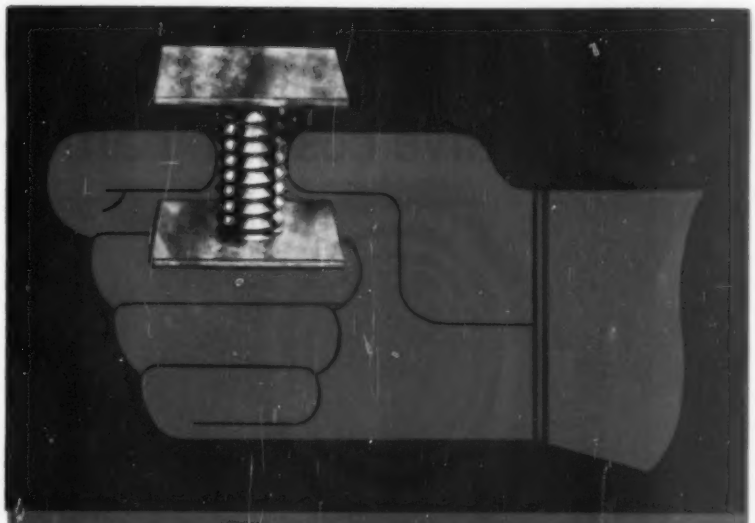
It would be highly desirable to improve mechanical properties of aluminum diecastings especially ductility. A 25 per cent improvement, or better, in modulus of elasticity would also significantly affect future applications of aluminum castings.

The typical heat treatment for a semipermanent molded casting is much too long. For daily production of 10,000 automotive cylinder blocks, the heat treating furnaces alone would cover more than 2 acres. A considerably shorter heat treatment, or none at all, would enhance future use of aluminum castings.

Because of the high cost of diecasting dies, there is a real need for improved and cheaper methods for making the die cavities rather than by a Kellering operation. If more than one die is required, use of precision cast dies appears promising.

Making and Using Shell Cores, by Robert S. L. Andrews, executive engineer, Demmler Mfg. Co., Kewanee, Ill. Until recently, the majority of shell cores were made hollow by inverting the corebox and draining the excess mix. This is still true for cores having cylindrical or box-like sections in the weight range of a few ounces to 10 lb before draining. But as the physical size of box-like shell cores increased, it was found that such cores suffered from these major defects: Metal breakthrough, physical distortion, and thermal expansion.

In many instances, oil-sand corebox equipment is being rigged and run hot on shell coremaking machines. Fair success is being met with this arrangement but where close dimensional accuracy, good surface finish, and minimum production cycles are required the core-



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to insure better castings
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Circle 653 on Page 53

"Rotoblast Steel Shot cuts abrasive costs in half!"

Rotoblast Steel Shot reduces abrasive consumption more than 50% at Atlantic Steel Castings

"Talk about a rugged cleaning job!" says Mr. William Burrows, Plant Manager, Atlantic Steel Castings Co., Chester, Pa. "Our castings are carbon and low alloy steel, running as big as eight tons each. We used to think we had a good abrasive until we tried Rotoblast Steel Shot. Our tests proved (and we double-checked them to make sure) that Rotoblast cut our shot consumption per wheel hour to less than half. That means our abrasive costs are cut exactly in half! Also we've found that Rotoblast gives us the kind of finish that our customers in the railroad, steamship, steam turbine* and automotive industries demand."

Prove Rotoblast's cost-cutting qualities in *your* plant. To arrange a trial, talk to your Pangborn man or write PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment — Rotoblast Steel Shot and Grit.*

**The toughest castings in industry to clean.*

Pangborn

ROTOBLAST® STEEL SHOT AND GRIT

box must be designed and built specifically for the shell process.

Shell cores set in conventional sand molds do not affect the feeding range of the product metal but they do affect the solidification time of several common foundry alloys. Thermal studies show that where the metal section is 0.5 in., solidification time is unchanged for all practical purposes but for sections of 1 to 1.5 in. solidification time may be reduced by as much as 20 per cent, especially where the shell core has large hollow sections.

How To Build a Scrap Pile, a panel discussion by William M. Grimes, president, Gartland Foundry Co., Terre Haute, Ind.; William A. Rodefeld, assistant chief metallurgist, Perfect Circle Corp., Hagerstown, Ind.; and Robert E. Hull, superintendent, Casting Service Corp., LaPorte, Ind. Moderated by Conference Chairman Dallas F. Lunsford, chief metallurgist, Perfect Circle Corp., Hagerstown, Ind., who explained that the subject referred to castings which must be scrapped and not to metal purposely accumulated for melting.

Mr. Grimes: In the early 1950s the speaker's foundry adopted the "D" process and spent ten months getting it installed and fully operable. The process worked but it was found that costs were above those of green sand molding. Consequently, the company during the last five or six years has concentrated on fundamentals of its previous practice in green sand molding. It started with cupola practice and moved into every one of its operations. The foundry is primarily a squeezer shop. Much attention is paid to sprue height, making sure it is adequate to provide necessary hydrostatic feeding. A comment by a disgruntled customer has helped the company to shape its philosophy and control program. The comment —"You never have time to do the job right, but time to do it over."

Mr. Rodefeld: Intelligent experienced personnel working with carefully planned operations can create an atmosphere leading to a scrap pile. Human errors are the reason. Despite modern facilities and production procedures and experienced personnel excess scrap is made at times. Why?

The first cause may be the quest for the magical potion that will

eliminate all troubles. Second cause may be of the side door variety. If you have a production problem, do you fix the cause or the effect? Third cause may be the almighty dollar sign. Have you been guilty of making a paper saving that ultimately winds up in a loss due to scrap or a quality insufficiency?

Fourth cause may be the straw that broke the camel's back. How many are guilty of saddling yourself or others with details so burdensome you cannot adequately carry out the broader aspects of your job? That job is training people, analyzing problems, supplying process specifications, eliminating or preventing the causes which create a scrap pile.

Mr. Hull: These five basic topics have a bearing on scrap castings: Patterns, sand, type of flasks, gating and risering, and human elements which also include supervision. The speaker's foundry is a job shop and production is short run. It is necessary to depend on the human element to determine how much, if any, repair is made to pattern equipment.

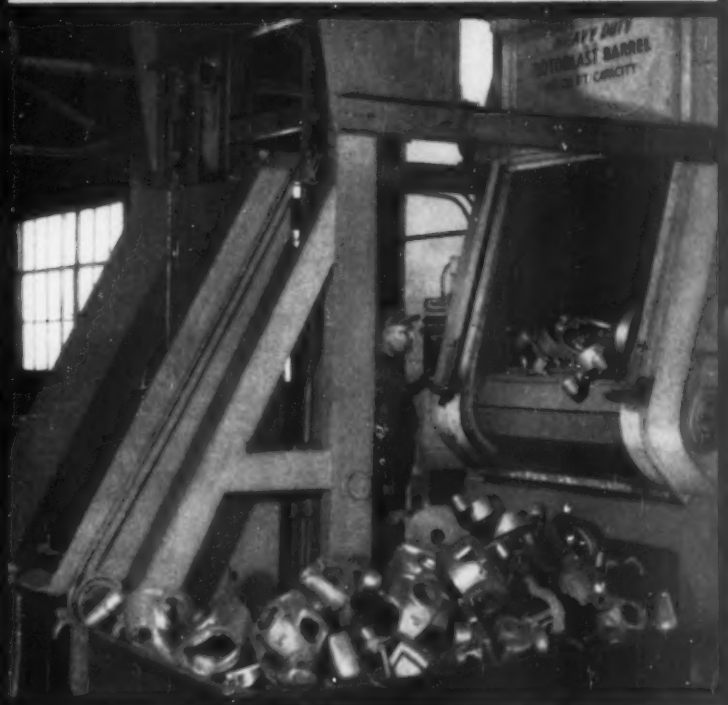
One type of sand is used for all production in this shop. This imposes no obstacle if it is kept under control. Biggest problem is hot sand in the summer. Flasks must be right size; tendency is to use flasks that are too small. This shop has standardized on flask sizes insofar as possible.

Gating and Risering

Gating and risering is a problem in the job shop. To reduce scrap castings, it is necessary to spend the time and labor necessary to make proper gates and risers for individual jobs. Most important factor on building a scrap pile is the human element. The better the supervision, the smaller the scrap pile. The company regards it as its responsibility to help educate the supervisor.

At the conference banquet on the evening of the first day, seven students enrolled in the Foundry Educational Foundation program were guests. Technical Chairman Howard B. Voorhees was master of ceremonies. Banquet speaker was V. Dewey Annakin, professor of sociology, Indiana State Teachers College, Terre Haute, Ind., and his subject "Backdrop for Survival."

ROTOBLAST CUTS CLEANING TIME 42%



Pangborn Rotoblast reduces cleaning time from 12-15 minutes per 2,000 lb. load to 7 minutes at Ingersoll-Rand

At Ingersoll-Rand Co., Painted Post, N.Y., blast cleaning loads weigh 2,000 lbs., include castings up to 300 lbs. each. To handle these loads efficiently, Ingersoll-Rand replaced its old blast cleaning barrel with a new Pangborn Rotoblast Barrel . . . and benefited *three* ways!

Cleaning quality is "incomparably better." Maintenance time and costs have been drastically cut. (For example, wheel vanes previously lasted 12 to 15 blast hours, now last 70 blast hours.) And cleaning time per load has been reduced from 12-15 minutes to only 7 minutes! Cleaning production now exceeds 10,000 lbs. per hour, cutting 7½-hour days to 3 and 4-hour days in the cleaning department.

For full details on how Pangborn Rotoblast can save you money, write: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment—Rotoblast Steel Shot and Grit.*®

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Around the Country

NEWS REPORTS FROM

Boston . . . Philadelphia

Boston— With the closing of the Mystic Iron Works furnace at Everett, Mass., numerous New England iron foundries are confronted with higher basic raw material costs in 1960. Cast scrap has advanced $6 to $8 per ton during 1959, and the trend is firmer. Mystic, which had operated since September, 1926, has a substantial stockpile, estimated between 35,000 and 40,000 tons, to be sold at current prices, $68.00 per gross ton, No. 2 foundry, f.o.b. Everett.

Foreign iron is offered in heavier volume at "reasonable" prices, but in months ahead the Troy, N. Y., furnace of Republic Steel Corp. will become the nearest basing point for domestic iron; with a $7.85 freight rate, No. 2 foundry iron will be $76.35 delivered Boston, the f.o.b. price from Troy being $68.50. Furnace price Buffalo is $66.50 with a $12.00 freight to Boston, and the Swedeland, Pa., price is $68.50 furnace, and $9.89 freight. Iron piled at Beacon, N. Y., also might be competitive in this area.

Although the melt of gray iron shops in December will approximate that of December, 1958, and in some cases slightly more, total production of castings for the year will be 20-25 per cent heavier, despite a prolonged strike at one Providence, R. I., district foundry.

Improvement has been most pronounced with textile machinery shops—close to 50 per cent over last year, with the five largest, three in New England, approaching 2000 tons of castings per month.

Textile mill equipment shops are mechanized and have the largest capacity in this area. Since 1947, textile machinery has been in the doldrums. Now, for the first time in more than a decade, several have backlogs, some as much as through July, 1960, at higher rate of operations.

Most malleable shops are operating five days per week and average close to 25 per cent over 1958 tonnage poured. Nonferrous foundries maintain the improvement first noted in October, 1957, although December will approximate the same month last year with one large captive unit. Marine requirements are somewhat heavier with nonferrous foundries.

Philadelphia— Despite the steel strike, most ferrous job shops this fall have done very well—and if it had not been for the strike, they would have done even better, operators declare.

With metal fabricating plants now cutting back all around, however, and many closing down completely, it appears that the worst is yet to come. For such dislocations of schedules mean an eventual further check on casting requirements, something likely to continue for several weeks after full resumption at the mills.

General thinking at the moment is that December business in castings not only will level off but will decline, with year-end seasonal influences also having a bearing.

It is thought, however, that the full effects of the steel strike, will come after the turn of the year, with casting demand probably hitting a low level for a few weeks and then turning upward rather sharply as spring approaches.

In gray iron, most foundries have

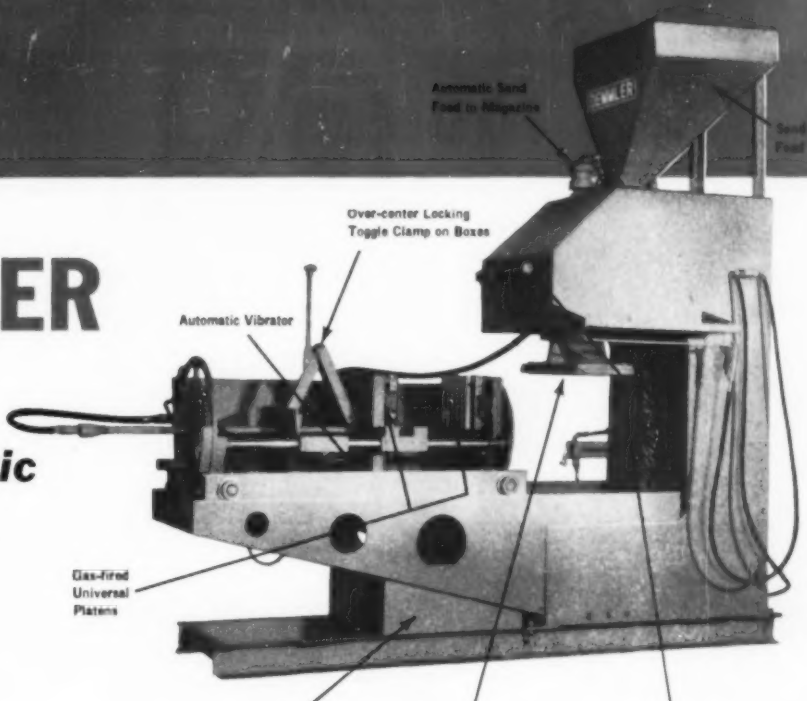
FEF Foundry-Industry Committee Meets

The Foundry Educational Foundation Foundry - Industry Committee of Missouri School of Mines and Metallurgy held its fall meeting Sept. 23 at Rolla, Mo. Some of the committee members are shown here. Standing, left to right: Dean C. L. Wilson, MSM; Willis Mook, Bethlehem Supply Co., Tulsa, Okla.; John Rendall, Miller & Co., St. Louis, committee chairman and former FEF scholarship student at Case Institute of Technology, Cleveland; Robert B. Parker, American Brake Shoe Co., New York, and FEF vice president; Jay Blanke, M. A. Bell Co., St. Louis; Webb Kammerer, Midvale Mining & Mfg. Co., St. Louis, a national trustee of FEF and a National AFS director, and E. J. Walsh, executive director of FEF.

Stooping, left to right: A. L. Hunt, National Bearing Div., American Brake Shoe Co., St. Louis; R. E. Hard, St. Louis Coke & Foundry Supply Co., St. Louis, and Donald Meiners, Carondelet Foundry Co., St. Louis.

NOW—a low cost true shell core blower of rugged Demmler quality for only $1995.00... shipping wt. 1500 lbs.

Typical cores suitable for production on the "Utility" shell core blower.


Automatic Sand Feed to Magazine
Sand Mix Feed Hopper
Over-center Locking Toggle Clamp on Boxes
Automatic Vibrator
Gas-fired Universal Platens
Screened Drain-Back Hopper
Field-proven Demmler Blow System
Master Control Valve with Safety Interceptors

DEMMLER

"Utility"

Semi-Automatic

Shell Core Blowers

OPERATING FEATURES:

1. Sand fed automatically from feed hopper into blow magazine. Hopper can be replenished without stopping production.
2. Over-center toggle lock for positive box closing and opening.
3. Master control lever shuttles box under blow head, clamps it, blows, unclamps and shuttles box to rollover drain position.
4. Rollover designed so that weight of boxes remain within the radius of rotation . . . no out of balance weight to struggle with.
5. Vibration applied to boxes automatically in rolled-over drain position for consistency of core wall thickness.

MODEL № 121015—VRD

Max. Box Size	12" x 10" x 15" Deep
Max. Core Weight, before draining	30 lbs.
Sand Feed Hopper Capacity	250 lbs.
Price, FOB Kewanee, Illinois	*$1995.00

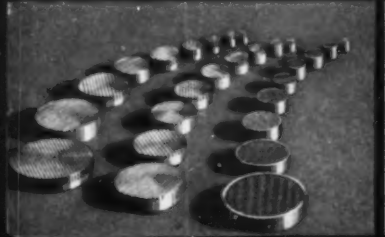
*Price includes quality blow-off gun and spray gun.

MODEL № 242030—VRD

Max. Box Size	24" x 20" x 30" Deep
Max. Core Weight, before draining	80 lbs.
Sand Feed Hopper Capacity	1000 lbs.
Price, FOB Kewanee, Illinois	*$4990.00

*Price includes quality blow-off gun and spray gun.

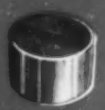
DEMMLER MANUFACTURING COMPANY • KEWANEE, ILLINOIS



PRECISION CORE BOX VENTS

Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

Circle 656 on Page 53



HL 150 MESH VENTS

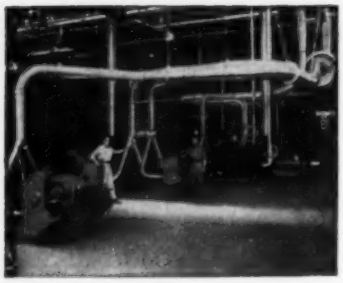
A new general purpose vent which practically eliminates the cleaning coarser screens demand. Write for literature on Demmler vents.

dust and fumes ... no problem

in famous foundries served by

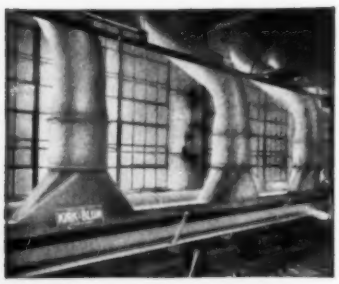
KIRK & BLUM

dust and fume control systems



● **GRINDING**

In the chipping and grinding departments, Kirk & Blum systems control dust; dry collection.

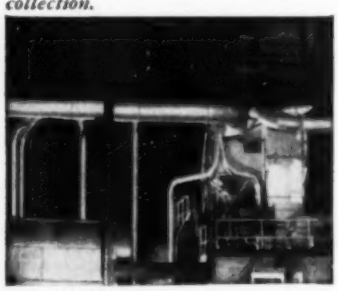


● **POURING**

"Moving Floor" pouring station. Forty-foot-long Kirk & Blum hood effectively removes fumes as they are formed.

● **SHAKE-OUT**

Clean air flows over the shake-out grate, removing dust below the operators' breathing level; wet collection.



● **SAND HANDLING**

Equipment is efficiently exhausted by a Kirk & Blum system; wet collection.

When a "dirty" foundry becomes "clean", important differences soon become apparent in worker efficiency, in maintenance and housekeeping costs, and even in plant-community relations.

If dust or fumes are a problem in your foundry, call on Kirk & Blum for the *complete* job—design, fabrication and installation. From 49 years of experience, Kirk & Blum engineers will be able to show you comparable problems efficiently solved the economical way.

For further details and illustrated booklet, write today to: The Kirk & Blum Manufacturing Company, 3108 Forrer Street, Cincinnati 9, Ohio.

kept rather close to a five-day-a-week schedule this fall. This has been particularly true of those engaged in light and medium work. This type of business has included castings for power transmission machinery, papermaking equipment, and pumps, valves and fittings. Components for textile machinery also may be included. Demand for heavy castings has been given some lift by a spurt in automotive die work. Backlogs have been running at two to three weeks.

Steel foundry operations in this area have been holding up better than some operators anticipated. By scratching hard for tonnage, most steel foundrymen have kept on a five-day week. Their task has been made particularly difficult by limited requirements for heavy industrial equipment. Delivery promises range around four to five weeks, because of the rather extended operations involved, such as heat treating and special cleaning.

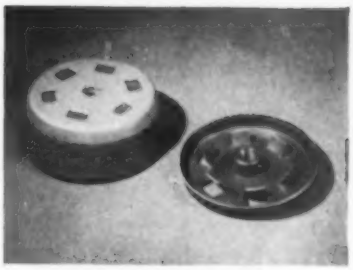
Malleable shops have been going along well, particularly in the light of continued good demand for pipe fittings and hardware. Operations have run more than five days a week at some plants. Business with the brass and bronze shops has been spotty,

In raw materials, prices on iron and steel scrap have been strong and tending upward. Pig iron supply has been ample, notwithstanding suspensions at some furnaces due to the steel strike. Domestic supply has been bolstered by importations. Foreign prices on iron are higher than they were earlier in the fall, but still average around $5 a ton less than those of the domestic market.

Porter Co. Opens Southern Works Refractories Plant

More than 100 state and local officials and members of the press recently attended the opening of the new Pascagoula, Miss., Works, Refractories Div., H. K. Porter Co., Pittsburgh. Major applications of the new plant's products are in steel, glass, cement, and nonferrous products. Products include chrome-magnesite, magnesite-chrome, and Periclase type brick in burned, unburned, and steel-encased bodies. In addition, a line of chrome and Periclase specialties is manufactured.

THE LITTLE NORTON WHEELS go a long way!



. . . last longer, save more, on all portable snagging jobs

Built-In Reinforcement is an available feature of Norton cup wheels in standard size 6 4¾ x 2" (ME 71249). The new steel cup bushing, molded firmly into the wheel back, provides added safety.

Your operators like the difference when they put Norton portable snagging wheels to work. You'll like it, too, when you add up your costs. Thanks to their built-in balance and uniform structure, Norton portable wheels *hug that work* with less vibration, less bounce — and they pay off with faster grinding, longer wheel life and less operator fatigue.

In the 100% complete Norton line you'll find wheels in the right sizes, shapes and abrasive-bond combination for snagging all metals. For example:

- *Wheels of 44* ALUNDUM* *abrasive and the B11 bond are best for snagging steel. "44," although non-premium priced, is tougher and harder than other aluminum oxide abrasives. And the B11 resinoid bond enables precise duplication in half-grade increments of hardness, across the entire hardness scale.*
- *For gray iron and non-ferrous metals, use* CRYSTOLON* *abrasive K bond wheels — an unequalled combination of silicon carbide abrasive and vitrified bond for slow speed snagging.*

See how you can snag off more metal per dollar with Norton wheels. See your Norton Distributor or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Favorable Outlook Seen for

FOUNDRY EQUIPMENT DEMAND

By WILLIAM G. GUDE
Managing Editor

EINAR A. BORCH
President

RICHARD A. BRACKETT
First Vice President

CHESTER G. HAWLEY
Second Vice President

● Outlook for both near-term and long-range demand for foundry equipment is favorable, it was indicated at the 41st annual meeting of the Foundry Equipment Manufacturers' Association. More than 100 persons attended the meeting, held at the Greenbrier, White Sulphur Springs, W. Va., Oct. 15-17.

The society's Statistical Committee chairman, Einar A. Borch, National Metal Abrasive Co., presented results of sales forecasts by member companies which pointed to a continuation next year of the improved business recorded so far in 1959 compared with 1958.

Since a previous study indicated that foundry equipment is replaced, on the average, between 10 and 20 years, there are expectations of a sizable replacement market in the years ahead. Mr. Borch pointed out that "shipments during the decade 1940 through 1949 were of record proportions. Sales representing replacement of that equipment should be substantial during the next few years, and, coupled with the anticipated wave of expansion programs certain to come in the 1960s, should produce another record-breaking decade of shipments of foundry equipment for an extended period."

The report warned, however, that development of new and improved equipment, not 1940-style equipment "just warmed over," will be necessary for this forecast to be realized.

FEMA President Gordon E. Seavoy, vice president, Whiting Corp., Harvey, Ill., presided at the annual business meeting and presented his annual report on the activities of the society. Featuring the meeting was a panel discussion of "Depreciation of Foundry Equipment," with Richard A. Brackett, executive vice president, Spencer Turbine Co., Hartford, Conn., serving as moderator.

What can be done under present laws to recover, through depreciation charges, the cost of equipment was discussed by Joseph E. Tansill, manager, Tax Department, Lybrand, Ross Bros. & Montgomery, Chicago. He explained various ways of charging depreciation, including the straight-line, the declining balance, and sum of years digits methods.

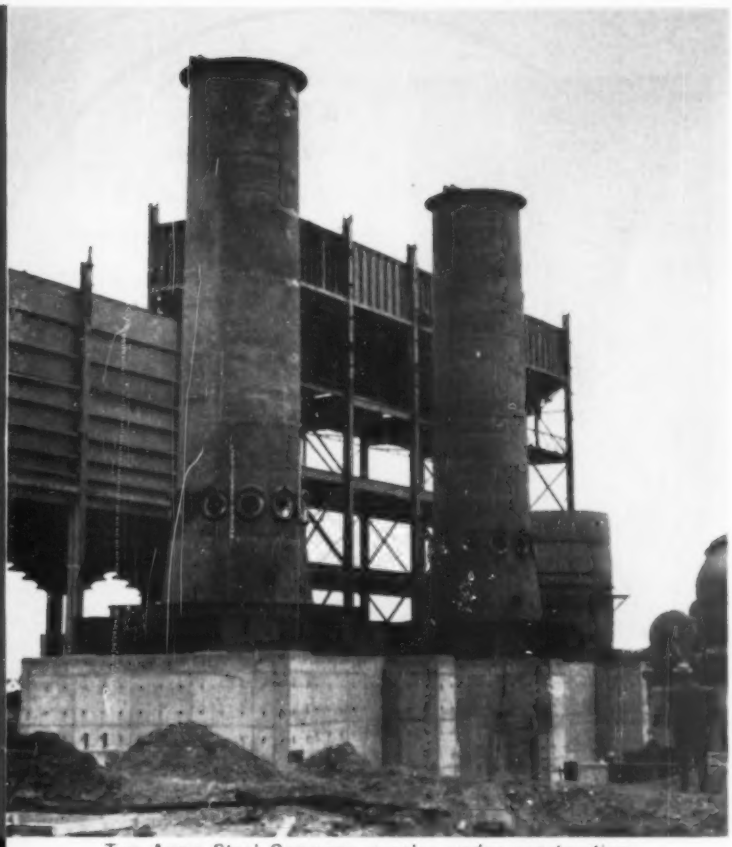
There is only a limited tax advantage in leasing equipment rather than its outright sale, Mr. Tansill indicated. Instances in which the tax advantage might be of importance in leasing exist where only a short-term use of the equipment is expected, or where there are fears that the equipment will become obsolete quickly.

Further reforms in government regulations affecting depreciation are needed, it was stated by Charles W. Stewart, president, Machinery and Allied Products Institute, Washington. The present law does not consider the effects of inflation, a situation which is causing an annual cost to industry of $6 billion. Mr. Stewart urged industry to make maximum use of present allowances on tax depreciation before pushing for other reforms. This is a management problem and requires a public relations job to achieve future reform.

Reports of program and activities of other foundry trade associations and societies were presented at one session. These reports were prepared by the following:

Foundry Educational Foundation, R. B. Parker, American Brake Shoe Co., New York; Foundry Facings Manufacturers Association, J. H. Whitehead, Whitehead Bros. Co.,

World's largest cupolas at Acme Steel Company use...



Two Acme Steel Company cupolas under construction.

Photo illustrates a temporary sub-assembly following machining of a section of the three-block-high "National" carbon well zone lining.

NATIONAL
TRADE-MARK
CARBON LININGS

These two cupolas will provide hot metal for Acme Steel Company's new oxygen converter plant at Riverdale, Illinois. Both of these cupolas measure 13 feet at the base plate and each will accommodate a 40-foot column of raw materials as compared to the 25 feet of a typical cupola.

These carbon linings — because of their chemical resistance and physical stability at high temperatures — permit extended campaigns without shutdown for lining repairs. This affords saving in maintenance materials and labor while maintaining production.

Here again is an outstanding example of the trend to carbon in cupola linings. Its resistance to attack from either acid or basic slag, low co-efficient of thermal expansion, and high strength at elevated temperatures make "National" carbon an ideal material for lining cupola wells, breast areas, front slagging spouts and slag dams.

"National" and "Union Carbide" are registered trade-marks of Union Carbide Corporation

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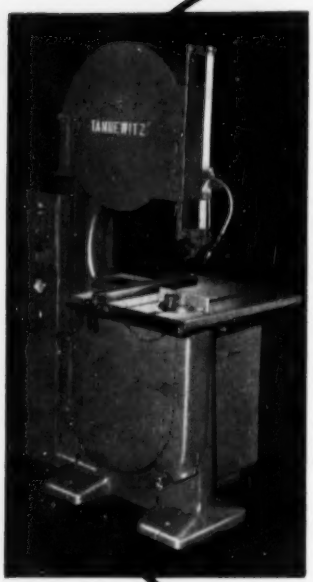

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Replacing your old band saws, used in cutting off gates and risers of ferrous and non-ferrous castings, with Tannewitz Band Saws is one of the best dividend-paying investments you can make. They cut many times faster, reduce down-time and repairs to almost nothing, pay for themselves in short order. Available in 24" to 52" wheel sizes with variable speeds from 60 to 15,000 FPM, or single speed to suit your particular production requirements as established by testing of your materials in our factory. Write or phone for details.

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THE "CEMENT GUN"® METHOD

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Write for Bulletin No. 3000-B Today!

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New York; Malleable Founders' Society, Dudley V. Walker, Eberhard Mfg. Co. Div., Eastern Malleable Iron Co., Cleveland; National Foundry Association, Arthur G. Hall, Nordberg Mfg. Co., Milwaukee; Non-Ferrous Founders' Society, Herbert F. Scobie, executive secretary; American Foundrymen's Society, William W. Maloney, general manager; Steel Founders' Society of America, Ross L. Gilmore, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.; Gray Iron Founders' Society, Donald H. Workman, executive vice president.

Irwin H. Such, editor-in-chief, *Steel* magazine, spoke on "Russia Today," describing his observations of industry of that country during a trip as a member of a team representing the American iron and steel industry. Mrs. Such, who traveled in Russia at the same time, discussed social aspects of Russian life.

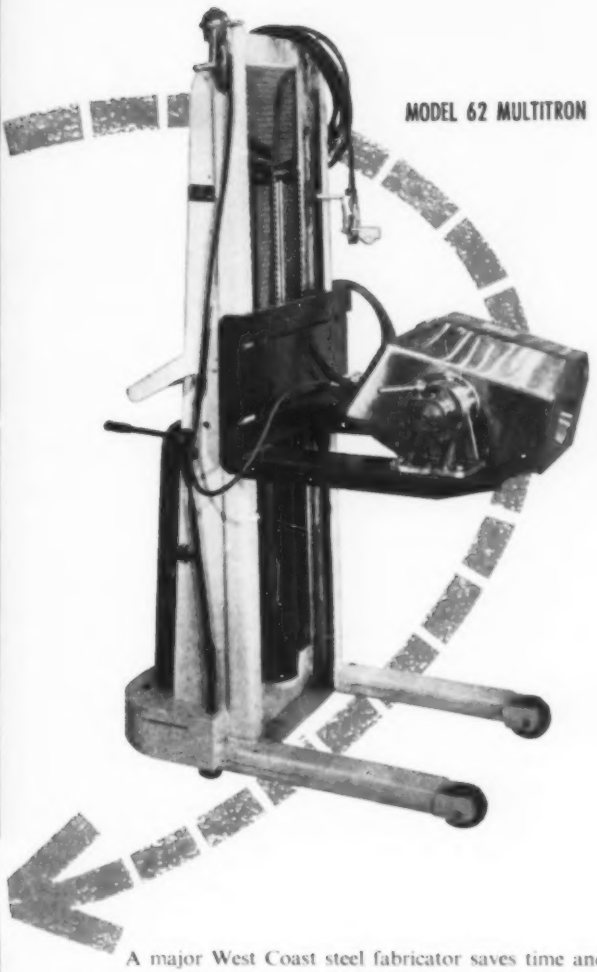
In the society's annual election of officers, Einar A. Borch, vice president, National Metal Abrasive Co., Cleveland, was named president to succeed Gordon E. Seavoy. Other officers elected are Richard A. Brackett, executive vice president, Spencer Turbine Co., Hartford, Conn., first vice president; and Chester G. Hawley, general manager of sales, Industrial Div., Jeffrey Mfg. Co., Columbus, Ohio, second vice president. C. R. Heller, Washington, was re-elected executive secretary-treasurer.

Newly elected directors are Charles H. Barnett, assistant to the president, Foundry Equipment Co., Cleveland; Odd H. McCleary, president, Mathews Conveyer Co., Ellwood City, Pa.; and Ralph M. Trent, president, Pangborn Corp., Hagerstown, Md.

"Next time you charge the cupola, get rid of these Christmas ties for me"

COMPLETING THE PICTURE . . .

Nuclear Systems-Economical Portable Radiography Machines



MODEL 62 MULTITRON

A major West Coast steel fabricator saves time and money by using a Nuclear Systems Model 62 with both cobalt and iridium sources for radiographic inspection of large diameter penstocks and pressure vessels.

This company not only uses Nuclear Systems equipment at its fabricating plant, but also uses the Model 62 in the field for final inspection at the construction site.

Versatility, portability, and low maintenance cost were prime considerations in the purchase of two Nuclear Systems units.

If you have an inspection problem, Nuclear Systems has a Radiography unit to meet your needs. For full information consult one of our sales offices. Also . . . inquire about Nuclear Systems regularly scheduled three-day Radiation Health Physics Course—an approved AEC licensing aid.

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THE BIG SWITCH IS ON

ERVIN WROBLEWSKI, Foundry Superintendent, Aluminum Casting & Engineering Co., Milwaukee, Wisconsin, says:

"Here is a very tough core . . . made easy with Acme Resin Coated Sand. After 3 years of continuous use of ACME RESIN we have found their resin for sand coating to give the highest tensile strength, best flowability, the fastest cure. No peel back and a Uniform Melt Point."

Of course, like every well-run foundry, Aluminum Casting & Engineering Co. have tested every resin on the market.

RESINS AND RESIN COATED SAND FOR SHELL MOLDS AND CORES IMMEDIATELY AVAILABLE FROM ACME RESIN OR DISTRIBUTORS LISTED BELOW

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(A Suburb of Chicago)

Circle 663 on Page 53

Panel members at the New York conference, left to right, included Myron De-Hollander, E. C. Troy, R. D. Sowers, W. A. Merriman, F. W. Tolan, and G. K. Dreher, SFSA market development director and moderator of the sales panels

SELLING OF STEEL CASTINGS

Subject of SFSA Conferences

More than 275 sales engineers and related personnel in the steel foundry industry attended the five Product and Market Development Regional Conferences conducted by the Product and Market Development Committee of the Steel Founders' Society of America.

The conferences were held in New York, New Orleans, Chicago, Seattle, and Los Angeles during October and November.

Format of the program was the same in each city. Frank Brugger, product sales manager, Kennametal Inc., Latrobe, Pa., presented a 35-minute movie entitled "The Machining of Steel Casting Surfaces," followed by a question-and-answer period.

Remainder of the program was a sales panel discussion, moderated by George K. Dreher, SFSA market development director. Five speakers in each of the host cities discussed various topics related to the sale of steel castings.

Speakers at the New York meeting were W. A. Merriman, Erie Forge & Steel Corp.; R. D. Sowers, National Malleable & Steel Castings Co.; E. C. Troy, Pennsylvania Electric Steel Casting Co.; Myron De-Hollander, Schenectady Foundries, General Electric Co., and F. W. Tolan, General Steel Castings Corp.

The New Orleans meeting was addressed by H. H. Brien, Texas Foundries, Inc.; Paul H. Stuff, Ross-Meehan Foundries; Adam S. Trowbridge, Bancroft & Ross Co. Ltd.; W. M. Ferguson, Texas Electric Steel Casting Co., and W. K. Merkel, K. O. Steel Castings Inc.

At Chicago the speakers included Charles Eder, Blaw-Knox Co.; Richard Krieg, Crucible Steel Casting Co.; Jules Hagans, Ohio Steel

Three members of the SFSA Product and Market Development Committee, left to right, are Chairman Roy Gezelius, General Steel Castings Corp.; James A. Bray, Mackintosh-Hemphill Division; A. A. Diebold, Atlas Steel Casting Co.

Foundry Co.; Charles Stul., Pelton Steel Casting Co.; James H. Lowe, Keokuk Steel Casting Co.

The Seattle conference speakers were Frank J. Frink Jr., Washington Iron Works; H. A. Conyne, Pacific Car & Foundry Co.; Al Ekeberg, Atlas Foundry & Machine Co.; Donald Livingston, Electric Steel Foundry Co. (British Columbia); Joseph McQuaid, Electric Steel Foundry Co. (Portland).

Speakers at Los Angeles were Raymond Taylor, Stanley Foundries Inc.; John E. Flesch, Alloy Steel & Metals Co.; William Patterson, National Supply Co.; B. George Emmett, Los Angeles Steel Casting Co.

Frank Brugger, Kennametal Inc., who opened each of the five conferences

An added feature of the Los Angeles meeting was a talk by Virgil Walters, purchasing agent, Utility Steel Foundry Co., on "The Relationship Between Sales and Purchasing."

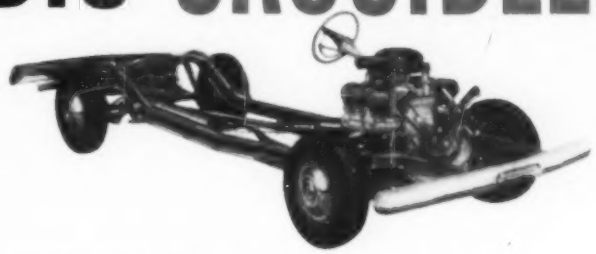
At the New York meeting, H. H. Blosjo, process engineer, Malleable Iron Fittings Co., discussed the sales value of SFSA Research Report No. 44 on "Studies of the Design of Steel Castings and Steel Weldments as Related to Methods of their Manufacture."

R. A. Gezelius, assistant vice president, General Steel Castings Corp., is chairman of the Product and Market Development Committee.

Forms Canadian Subsidiary

Michigan Abrasive Co., Detroit, has formed a Canadian subsidiary, Michigan Abrasive Co. of Canada Ltd., in Kingsville, Ont. Sales and service activities will be supervised by Victor R. Sanford.

SMALL CARS
BIG CRUCIBLES



Today's trend to smaller, light-weight cars will demand huge quantities of non-ferrous castings that must be produced to exacting standards of efficiency, economy and metal-purity.

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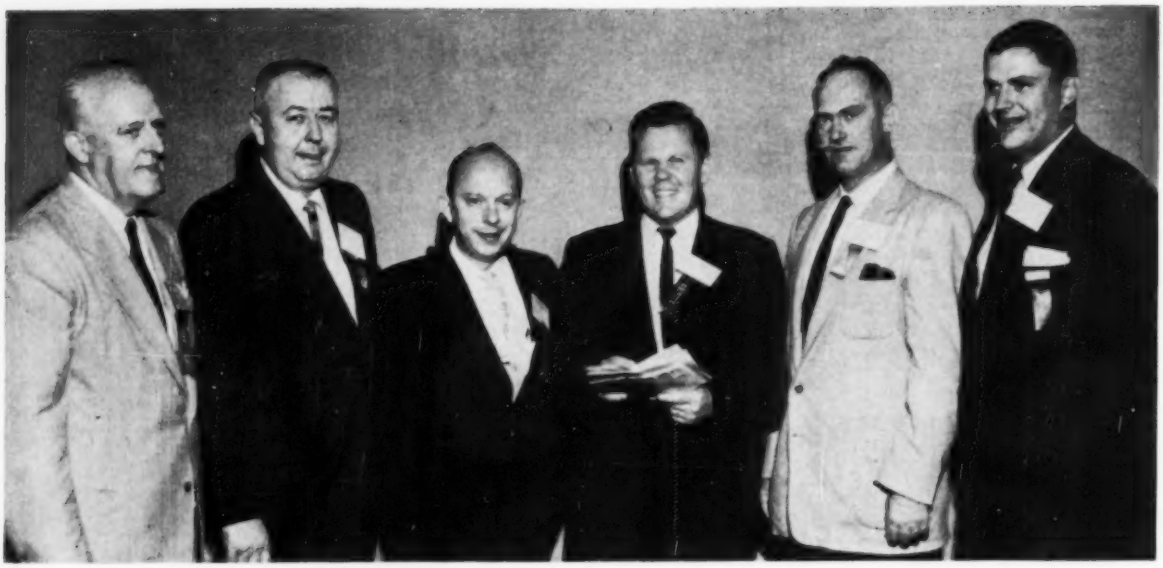

Some of the conference committee members are, left to right, James VanderMeulen, American Seating Co.; Charles Cousineau, Carpenter Brothers Co.; Jess Toth, Harry W. Dietert Co.; David L. Jacobson, Grand Haven Brass Foundry; Vernon J. Sadler, General Foundry & Mfg. Co.; and Robert Dodge, Foundry Services Inc.

MICHIGAN REGIONAL CONFERENCE

Stresses Quality Casting Production

By EDWIN BREMER
Metallurgical Editor

● DEPARTING from the tradition of alternate yearly meetings at Michigan State University and University of Michigan, the 1959 Michigan Regional Foundry Conference was held at the Pantlind Hotel, Grand Rapids, Mich., Oct. 8-9.

With Western Michigan Chapter, AFS, as the host, the conference also was sponsored by Central Michigan, Saginaw Valley, and Detroit Chapters in co-operation with the student chapters at University of Michigan and Michigan State University.

Nine technical sessions and two luncheons and a banquet were held during the conference. At the first day's luncheon, Herbert Weber, AFS, spoke on "Noise Abatement," pointing out that the noise problem is receiving considerable attention. Foundries must look into the situation, and hold noise to levels which will not impair hearing. The speaker then described various methods of accomplishing noise abatement.

At the annual banquet Dr. Richard C. Bates, Lansing, Mich., presented a talk on "How To Have a Heart Attack," and at the second day's luncheon F. B. Porzel, Armour Research Foundation, Chicago, spoke on "Atomic Blast—A Pattern for Survival."

Opening technical session was a panel discussion on **Cleaning Castings From Shakeout to Shipping**. Discussion leaders were George O. Pfaff, Wheelabrator Corp., Mishawaka, Ind., on blasting; B. J. Chenevert, Ford Motor Co., Dearborn, Mich., on grinding; R. Wigger, Ransohoff Inc., Hamilton, Ohio, on milling, and R. W. Leppien, Saginaw Malleable Iron Plant, Central Foundry Div., General Motors Corp., Saginaw, Mich., on quality of cleaning.

Mr. Pfaff pointed out that low blast cleaning costs can be obtained only by a comprehensive system for controlling operating efficiency and costs. Operating controls include reading the ammeter in the machine circuit, checking hot spots, screen analyses, abrasive additions, housekeeping, and dust collector performance. Most important are screen analyses. Cost controls should be established on cost per wheel hour, calculated by use of wheel-hour meters showing the time the wheel is in operation, records of amount of castings cleaned, abrasive additions, parts and labor.

Mr. Chenevert indicated that to obtain the most work from an abrasive wheel in snag grinding operations a compromise must be made between the work speeds and feeds which give maximum wheel life, and those giving easiest cutting and highest production rates. The grinding wheel manufacturer should be consulted on wheel selection,

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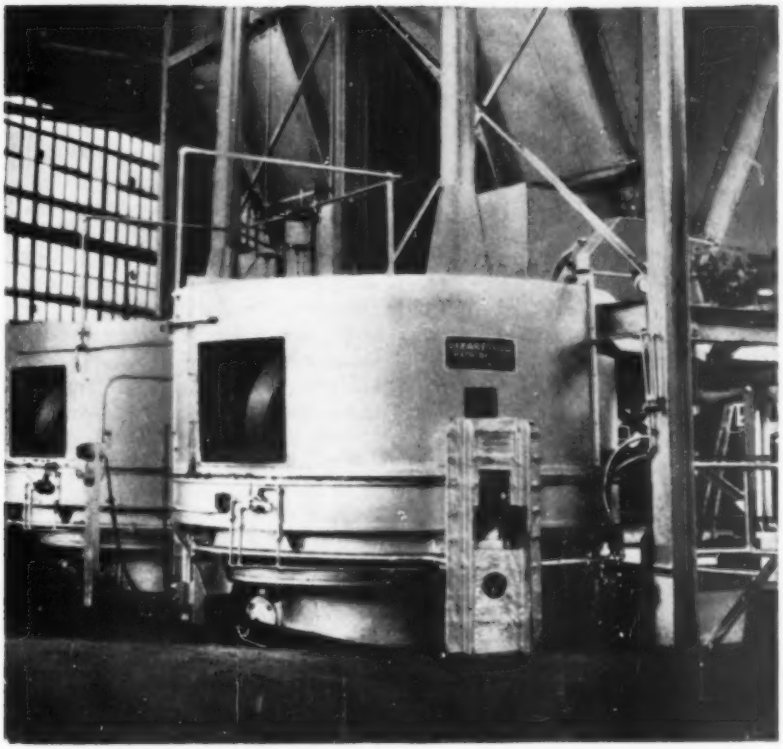

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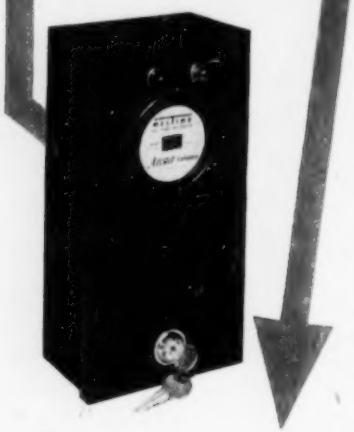

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and the foundryman must keep records to see that he is obtaining satisfactory results.

Useful records include daily production versus abrasive consumption, with monthly graphs to show progress or retrogression. Wheel changing can be controlled by requiring submission of worn wheel stub as evidence. Other recommendations: Move usable wheel stubs from one machine to another, and avoid excessive wheel breakdown on conveyorized machines by limiting work speed to a value just sufficient to take care of production—changing wheel specifications to suit if speed must be changed.

Mr. Wigger described several types of milling or tumbling equipment for cleaning castings. Wet milling in automatic media return units cleans in much less time than in dry units. Castings are supported and cleaned in an excess of stars which function effectively as the adhering sand continuously is being washed out of the machine. Since the liquid medium contains a rust preventive and is heated to about 160° F, the castings dry quickly after cleaning and do not rust easily.

Factors Controlling Cleaning

According to Mr. Leppien, several major factors control the extent of cleaning required to provide a "commercially clean" casting. In the foundry the factors include quality of the casting as it leaves the shakeout, heat treating operations performed, storage facilities prior to and after cleaning, processing operations, and degree of inspection required.

Consumer factors include surface finish required, machining locating points, clearances for subsequent machining operations, end use of the casting, and "eye appeal." Mr. Leppien indicated that each type of casting must be considered individually on what constitutes "commercial cleanliness," and the foundry should provide the best looking casting for the least amount of cleaning expense.

In a ferrous session, Jack Goudzwaard, Neenah Foundry Co., Neenah, Wis., discussed **Construction and Trends in Water-cooled Cupolas.** Transition from conventionally lined stack to water-cooled cupola without a lining can be accomplished gradually. First step might be application of water on the shell to prevent hot spots which occur in extended heats. Next step could be installation of water jackets or glands inside the cupola and lining material may or may not be placed over them. After installation of jackets or glands it may be necessary to install water-cooled tuyeres. Final step is the lining-free cupola, water cooled from below the charging door down to the bed plate. Such a cupola permits considerable flexibility of operation.

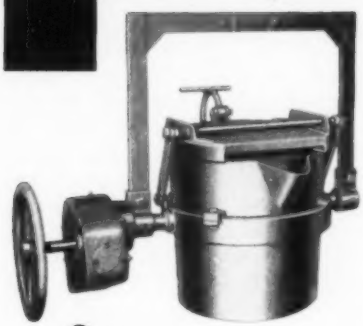
High Strength Cast Iron, according to Ralph A. Clark, Union Carbide Metals Co. Div., Union Carbide Corp., Cleveland, usually has a low carbon content—around 3 per cent—with the composition additionally adjusted to produce a pearlitic matrix with the combined carbon about 0.70 per cent. To insure random graphite distribution, inoculation with various types of graphitizing agents usually is practiced. While iron with strength of 40,000 psi can be made without alloying, general practice is to use various agents, usually in combination, to obtain improved properties other than strength alone.

Malleable Base Spheroidal Iron was discussed by J. T. Bryce, Albion Malleable Iron Co., Albion, Mich. That material, as the name indicates, is made by adding appreciable amounts of sulfur to regular malleable iron compositions. After heat treatment, the graphite occurs in a spheroidal form. The iron has a tensile strength of 90,000 to 123,000 psi, with yield strength of 68,000 to 118,000 psi, elongation of 2 to 7 per cent, and Brinell hardness of 180 to 320. Variations in properties are obtained by type of heat treatment.

Nonferrous sessions dealt with production, sands, and melting. **Controlled Production,** by L. E. Capek, Du-Wel Metal Products Inc., Bangor, Mich., dealt with setting up controls in diecasting operations to produce castings satisfactory to the customer with minimum losses. First step is to find out what the customer desires or expects in condition, surface finish, dimensions, flash, etc., and the speaker showed an itemized form for the customer to fill out. That becomes the basis for inspection control in the plant, and for set-

easy

one-man pouring on smaller jobs



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Circle 667 on Page 53

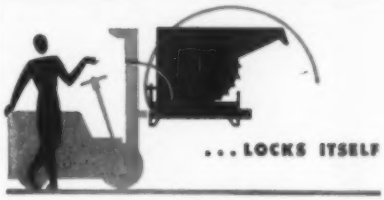
ting up the quality control system.

Metal Efficiency in Magnesium Casting Operations, by F. C. Bennett, Dow Metal Products Co. Div., Dow Chemical Co., Midland, Mich. Excessive metal losses in foundries processing magnesium alloys can be explained and controlled more readily by means of material balance studies. Flow charts can be used to develop the role of casting efficiency and poured ratio for any combination of the unit loss variables.

Synthetic Sands for Nonferrous Castings, by Tom Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Skokie, Ill. Desire for closer tolerances has led to use of synthetic sands since they can be compounded to improve the properties or to provide added properties. No standard formulation of sands will function satisfactorily in all cases, and each foundry should develop the one most suitable for its own operations. Contrary to general belief, better results are obtained by use of high-strength sands which can be rammed to high mold hardness.

Fine sands tend to lose flowability, and for good surface on castings sands with a grain size of 100 to 110 are preferable to those with a fineness of 140 to 150. As an example, Mr. Barlow pointed out that in production of plumbing ware good results were obtained with a weak natural sand of 110 grain fineness as the base. Addition of 7 to 8 per cent southern bentonite with 3 to 4 per cent moisture resulted in a sand with a green strength of about 16 psi, and 28 to 30 permeability. Molds were made in a high-pressure squeeze machine.

Combustion Relating to Oil and Gas Fired Nonferrous Melting Furnaces, by A. C. Schmid, Joseph Dixon Crucible Co., Detroit. Best performance in a melting furnace to obtain economy and casting quality requires good burner design which proportions the fuel and air properly and mixes them together thoroughly. Judging condition of the furnace atmosphere by flame color requires considerable experience, and often is misleading. Best procedure is to analyze the furnace atmosphere with suitable equipment and adjust the burners until



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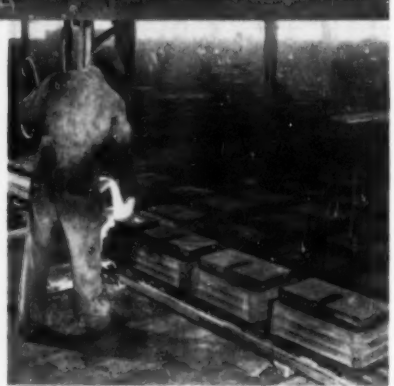

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the proper condition, usually slightly oxidizing, is obtained.

Three general technical sessions and a special meeting for students were held on Friday. Students were addressed by E. Frens, General Electric Co., on **Job Potential and Opportunities in the Foundry Industry.**

Proper Gating Through the Use of Cobalt 60, by K. E. Spray, Central Foundry Division, General Motors Corp., Saginaw, Mich. Numerous examples were shown of how gamma ray examination aided production of sound pearlitic malleable castings through proper gating. In many cases gating was simplified. More detailed description of the results was presented on Pages 123 to 125 in the April issue.

Directional Solidification as Related to Design, by W. P. Dudley, Ohio Steel Foundry Co., Springfield, Ohio. Careful control of directional solidification is essential in producing quality castings. The various procedures of tapering sections, application of chills, placement of risers, and location of gates to attain proper solidification were illustrated. Permanent records of the methods should be made so that they will be available for future use.

Closing session was a panel discussion on "Diversification for the Foundry and Means of Survival." Panel members were Sam Hodler, Golden Foundry Co., Columbus, Ind.; W. C. Truckenmiller, Albion Malleable Iron Co., Albion, Mich., and Walter Szott, Central Foundry Div., General Motors Corp., Danville, Ill.

Diversification of Processes, by Mr. Hodler. No one process can do all jobs best, and various methods of molding and coremaking should be studied to provide economy and better profits. In some cases turning to permanent molding or diecasting may be the answer. Or shell cores or shell molding might be the most suitable procedure, and the same might be said for the CO_2 process for molds and cores.

Diversifying the Customers, by Mr. Truckenmiller. Annual cyclical nature of sale of manufactured goods necessitates acquiring customers in widely diverse industries so that fluctuations in demand are held to the minimum. Before proceeding the foundry should con-

Circle 670 on Page 53

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Circle 671 on Page 53

sider its physical facilities, available manpower, and potentialities. Possible markets should be studied to determine the direction in which to go. Planned attack involving sales effort, research and development, training of personnel, etc., is necessary to reach the goal.

A sound motion picture depicting co-operative work of Albion Malleable with the Ordnance Department in developing pearlitic malleable 80-mm mortar shells also was shown.

Need and Willingness To Serve the Customer, by Mr. Szott. Increasing use of automatic machining and demands for closer tolerances require closer attention of the foundry in producing castings which will satisfy the customer. Statistical quality controls, close inspection and use of magnetic particle and radiographic procedures are required to meet the demands. Additionally customer follow-ups to check complaints as well as to suggest design changes which will aid in producing better castings should be made.

Co-operative engineering by the foundry with the customer often leads to new business through conversion from other methods of fabrication. Design conferences for active and prospective customers also help to acquaint them with the most suitable procedures which will result in quality castings.

Proposed Revision of Scrap Classification Available

A proposed revision of Simplified Practice Recommendation R58-36, Classification of Iron and Steel Scrap, now is being circulated to sources of iron and steel scrap, processors, and users, for their approval.

The revision was requested by the Institute of Scrap Iron and Steel Inc. to modernize the classification of such material and reflect present practices in the industry. The number of grades of scrap has been reduced to four, and new classifications have been added. The revision also defines the desired cleanliness of the scrap, as well as off-grade material and residual alloys.

Copies are available from the Commodity Standards Div., Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.

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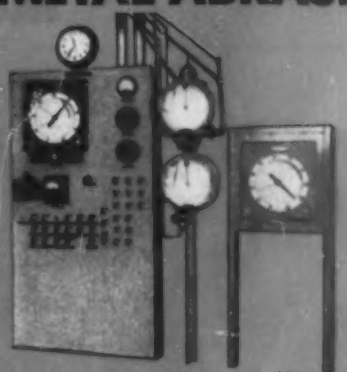

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W. THOMAS GETTIG
. . . LFM Mfg. Co. v. p.

A. H. HINTON
. . . AFS Chapter chairman

Conrad L. Daniels has been appointed works manager of the Rockford, Ill., plant, J. I. Case Co., succeeding **Lawrence H. Hodges,** who has been promoted to a position in the central engineering department at company headquarters in Racine, Wis. Mr. Daniels was plant manager, Mergenthaler Linotype Co., Brooklyn, N. Y.

Joseph B. Lanterman, president, American Steel Foundries, Chicago, has been elected director of International Harvester Co.

Dr. Carleton C. Long, director of research, St. Joseph Lead Co., New York, has been elected president of the Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers. He will take office next February, succeeding **Dr. John Chipman,** Massachusetts Institute of Technology. **J. S. Smart Jr.**, general sales manager, American Smelting & Refining Co., New York, has been named vice president.

Charles W. Beauchamp has been appointed marketing manager, and **Kendrick M. Hickman,** sales manager, Ewart Works, Link-Belt Co., Indianapolis. **Forest H. Spencer,** sales manager at Ewart since 1948, retired recently after 40 years with the company. Messrs. Beauchamp and Hickman have assisted him there in sales management.

Carl Decina, for the past year with Superior Bearing Co., Buffalo, has been named plant superintendent, Rolle Mfg. Co., Lansdale, Pa. Previously he was with Aluminum Co. of America, Buffalo.

W. Thomas Gettig has been named vice president and general manager, LFM Mfg. Co., Atchison, Kans., subsidiary of Rockwell Mfg. Co., Pittsburgh. With the Rockwell organization since 1933, he has been assistant to the vice president of the company's Meter & Valve Div. since 1957.

Frank X. Bujold, formerly manufacturing manager of foundries, Engine & Foundries Div., Ford Motor Co., Detroit, has been named general manager, Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich. **Richard Couch** has resigned as vice president-sales of the division. With Ford since 1949, Mr. Bujold served as division controller, manager of foundries, and general manager of the foundry division.

Dr. Morris Cohen, professor of physical metallurgy, Massachusetts Institute of Technology, has been named recipient of the Francis J. Clamer Medal of the Franklin Institute, Philadelphia. The award is in recognition of his investigation and exposition of the physical metallurgy of heat treatment of steels.

A. H. Hinton, chairman of the Northeastern Ohio Chapter of the American Foundrymen's Society for 1959-60, since 1945 has been plant manager of the Cleveland sand foundry, Aluminum Co. of America. He joined Alcoa in Cleveland 31 years ago, later going to company plants in Buffalo and Detroit. He became superintendent of the Bridgeport, Conn., plant in 1936.

Albert J. Coulson, since 1943, superintendent, United Engineering & Foundry Co., Vandergrift, Pa., retired recently after 22 years with the company. He joined the Vandergrift plant as foundry foreman, and become acting superintendent in 1942. **Arthur B. Kommel** has succeeded Mr. Coulson as plant superintendent. He joined Vandergrift in 1937, became research metallurgist, chief metallurgist, and assistant superintendent.

Rex Williams Jr. has joined Diamond Alkali Co., Cleveland, as sales service representative in Alabama and part of Florida. He succeeds **William N. Chastain,** who has been transferred to Charlotte, N. C., to cover the western part of the state.

Bernard J. Alperin, recently supervisor of inspection, Everett Foundries, General Electric Co., Everett, Mass., has been named manager of product engineering

Modern grey iron foundry technology requires more and more alloying of metal in order to achieve the best physical characteristics of various castings. When cast scrap, particularly automotive, comes back to the foundries, these alloys remain as trace elements which can have very adverse effects on the quality of other types of castings. Chrome, Vanadium, Molybdenum and others, while improving the quality of some castings, are very damaging as trace elements to others.

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. . . heads Piedmont Chapter

LEWIS H. KARPF
. . . joins Chas. Taylor Sons

HENRY SWIGERT
. . . steel products sales

CHARLES J. NAULTY
. . . Link-Belt district mgr.

there. In 1952 he joined the company's Erie, Pa., foundries as a nonferrous metallurgist, and in 1957 became development engineer at the Applied Research and Development Laboratory of the foundry department in Schenectady, N. Y.

Wallace E. Boswell, chairman of the Piedmont Chapter of the American Foundrymen's Society for 1959-60, has been with Glamorgan Pipe & Foundry Co., Lynchburg, Va., since 1950. He is assistant to the general manager, primarily in charge of research and development. Mr. Boswell is a member and former chairman of the Industrial Engineering and Cost Committee, AFS, and is a member of the Technical Committee, American Cast Iron Pipe Research Association.

Chester E. Grigsby, vice president and director, American Steel Foundries, Chicago, and since 1957 general manager of its Transportation Equipment Div., has been named head of the division. He succeeds **Charles L. Heater,** who has retired after almost 40 years with the company. Mr. Grigsby joined American Steel Foundries 36 years ago.

Lewis H. Karpf has been appointed a ceramic engineer in the research and development department, Chas. Taylor Sons Co., Cincinnati. He was formerly a research assistant at the Tile Council of America Research Center.

Henry Swigert has been named sales representative in Arizona and New Mexico for Electric Steel Foundry Co., Portland, Oreg., with headquarters in Phoenix, Ariz. For the past four years he has been in the company's production, metallurgical, and sales departments.

Carter De Laittre, elected chairman of the Twin City Chapter of the American Foundrymen's Society for 1959-60, since 1957 has been works manager, Minneapolis Electric Steel Castings Co., Minneapolis. He joined the company in 1946 as assistant superintendent and became superintendent in 1948.

Charles J. Naulty has been appointed sales manager for the Pacific southern division, Link-Belt Co., Chicago. He will serve as district manager for the Los Angeles sales territory and as sales manager for the plant at Montebello, Calif. Mr. Naulty succeeds **Benjamin M. Prestholt,** transferred to Chicago where he will specialize in engineering sales for bulk material handling equipment.

Jack W. Ross has been named manager of primary metals industries sales, Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich., with headquarters at the Chicago factory branch. Since 1952 he has been sales supervisor of Clark's heavy-duty equipment.

Rosemond K. Bell, in charge of the nonferrous laboratory unit, Analytical Chemistry Section, National Bureau of Standards, has

CHESTER E. GRIGSBY

CHARLES L. HEATER
. . . changes at American Steel Foundries

CARTER De LAITTRE
. . . AFS chapter chairman

JACK W. ROSS
. . . Clark Equipment sales

BQ AUTOMATIC

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★ **makes harder moulds**

★ **costs less—**
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FAVERSHAM KENT ENGLAND

Circle 674 on Page 53

WILLIAM L. HARTLEY
. . . retires, Link-Belt Co.

ALVIN R. ARRICK
. . . sec'y., Herman Pneumatic

J. PAUL MADDOX
. . . becomes division mgr.

CHARLES E. SEMAN
. . . heads Tennessee Chapter

been awarded the Silver Medal for Meritorious Service of the U. S. Department of Commerce for superior performance in the precise chemical analysis of metals and alloys.

William L. Hartley, since 1952 executive sales engineer, Link-Belt Co., Chicago, has retired after more than 40 years with the company. He served as Detroit district manager, manager of Central Division equipment sales, and Eastern Division sales manager in Philadelphia. Mr. Hartley plans to live in Arizona.

Donald N. Rosenblatt, chairman of the Utah Chapter of the American Foundrymen's Society for 1959-60, is assistant manager, American Foundry & Machine Co. Div., and chief metallurgist for the division and Eimco Corp., Salt Lake City, Utah, the parent company. He joined American Foundry & Machine Co. in 1946 as a metallurgist. Mr. Rosenblatt is chairman of the Steel Division of the American Foundrymen's Society, and a former chairman of the Utah Chapter of the American Society for Metals.

Alvin R. Arrick has been elected secretary, Herman Pneumatic Machine Co., Pittsburgh. He has been a certified public accountant for many years.

J. Paul Maddox, formerly with Mexico Refractories Co., Mexico, Mo., has been named manager of the Specialties Div., North American Refractories Co., Cleveland.

Walter A. Stengl has joined Castalloy Co., Natick, Mass., as plant manager. He was formerly chief metallurgist and superintendent, Raleigh Mfg. Co., Philadelphia.

Charles E. Seman, chairman of the Tennessee Chapter of the American Foundrymen's Society for 1959-60, is general superintendent of Crane Co.'s Chattanooga Div. During the war years he was on government projects doing consulting work in Europe. Previous connections include the Bonney-Floyd Co., Columbus, Ohio, eastern representative for the National Foundry Association in New York, and Continental Die Casting Corp., Div. of F. L. Jacobs Co., Detroit.

Edward Elliott Jr. has joined Liquid Carbonic Div., General Dynamics Corp., Chicago, as manager of industrial-medical sales. Previous associations include Cambridge Corp., Div. of Carrier Corp., Syracuse, N. Y., and Pressed Steel Tank Co., Milwaukee.

Fred I. Johnson has been appointed sales engineer, Foundry Equipment Co., Cleveland. With headquarters in Elmhurst, Ill., he will cover northern Indiana and northern and eastern Illinois.

E. Raymond Filosi has been appointed facilities engineer, Foundry Department, General Electric Co., Schenectady, N. Y. For the past year he has been manager-manufac-

DONALD N. ROSENBLATT
. . . Utah Chapter chairman

WALTER A. STENGL
. . . joins Castalloy Co.

EDWARD ELLIOTT JR.
. . . becomes sales mgr.

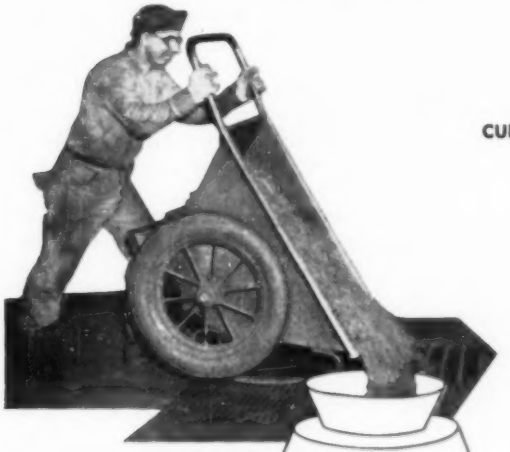
FRED I. JOHNSON
. . . Foundry Equipment Co.

SAVE $36.00 a ton on cast iron chips

New Whirl-Air-Roxy method delivers chips from Machine Shop to Cupola *(patented)*

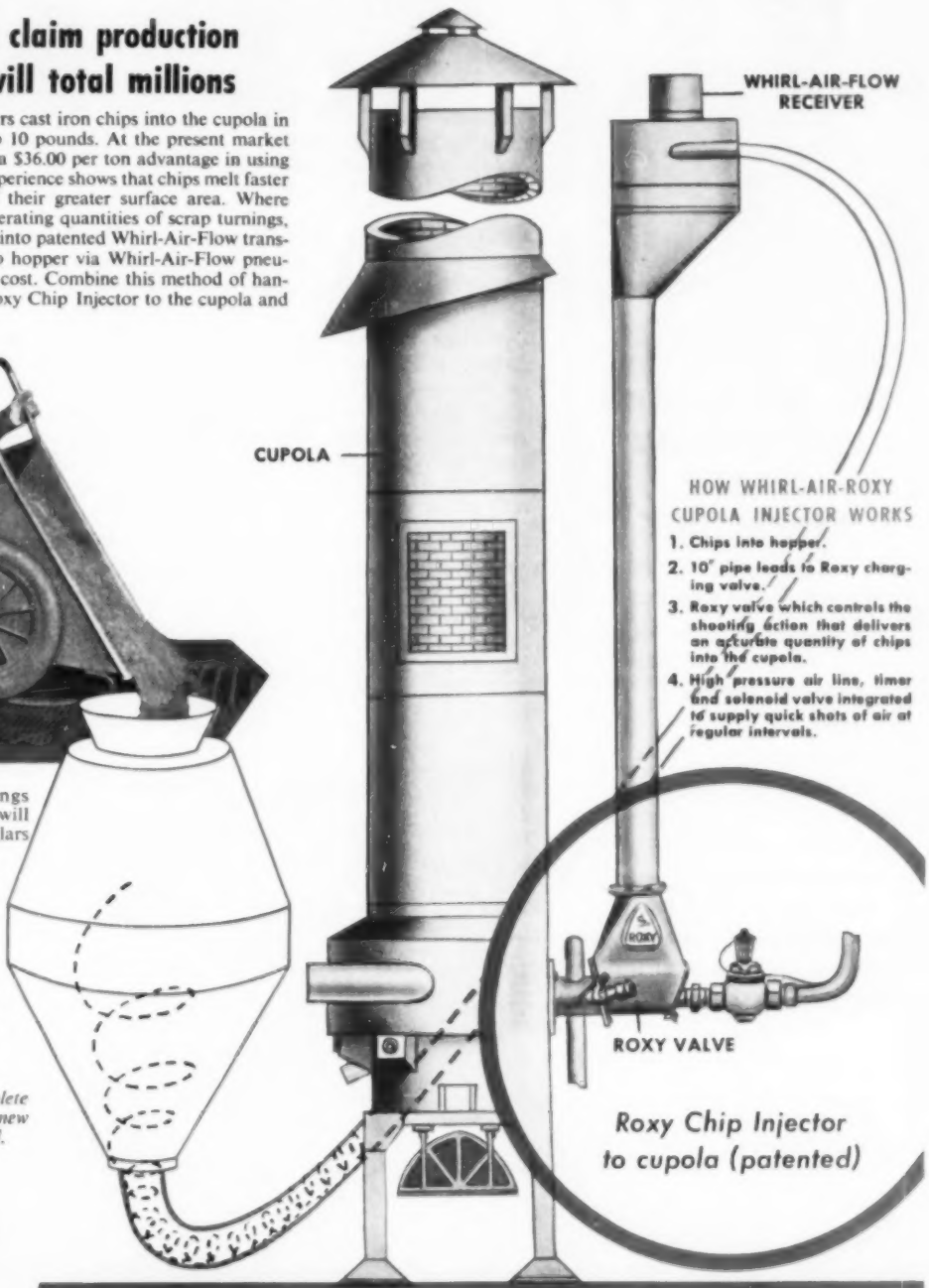
Foundries claim production savings will total millions

New Roxy valve delivers cast iron chips into the cupola in measured shots of 7 to 10 pounds. At the present market value of scrap there is a $36.00 per ton advantage in using chips. Also, foundry experience shows that chips melt faster than scrap because of their greater surface area. Where machine shops are generating quantities of scrap turnings, they can be discharged into patented Whirl-Air-Flow transporter and delivered to hopper via Whirl-Air-Flow pneumatic conveyor at low cost. Combine this method of handling chips with the Roxy Chip Injector to the cupola and



you will achieve savings that foundrymen say will amount to a million dollars in very few years of operation. The Whirl-Air-Roxy method is easily applied to any size foundry; small, medium or large. Initial cost is low and savings will pay for installations in a period of a few months. We invite your exploratory inquiry.

Write or wire for complete information on the new Whirl-Air-Roxy method.


WHIRL-AIR-FLOW RECEIVER
CUPOLA
HOW WHIRL-AIR-ROXY CUPOLA INJECTOR WORKS
1. Chips into hopper.
2. 10" pipe leads to Roxy charging valve.
3. Roxy valve which controls the shooting action that delivers an accurate quantity of chips into the cupola.
4. High pressure air line, timer and solenoid valve integrated to supply quick shots of air at regular intervals.
ROXY
ROXY VALVE
Roxy Chip Injector to cupola (patented)

WHIRL AIR FLOW PNEUMATIC CONVEYORS

WHIRL-AIR-FLOW

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Hamilton, Ontario

Circle 676 on Page 53

WILLIAM B. COLWELL
. . . public relations supervisor

GEORGE J. PROBOST
. . . Rolle Mfg. sales

turing engineering for the Everett-Lynn Foundries, Everett, Mass. He joined the company in 1936.

William B. Colwell has been named public relations supervisor of the Personnel and Public Relations Div., American Steel Foundries, Chicago. He was formerly with the Wall Street Journal's Chicago bureau.

Richard W. Arter has been named sales manager of the Industrial Div., recently established by Misco Precision Casting Co., Whitehall and Muskegon, Mich. Mr. Arter joined the company in 1956 and was formerly technical representative in the Ohio area. **Harold J. Beauregard,** since 1952 general foreman and superintendent of the Whitehall plant, has been made plant superintendent for the division. **James C. Hall** has been appointed chief engineer, and **William Warren,** quality supervisor. Mr. Hall has been a project engineer, and Mr. Warren process engineer for Misco.

George J. Probost has been named sales engineer, Rolle Mfg. Co., Lansdale, Pa. He was formerly with Aluminum Co. of America's Buffalo plant, and more recently in sales engineering in Alcoa's Philadelphia area.

Heading Misco's Industrial Div., left to right above, are Harold J. Beauregard, Richard W. Arter, William Warren, and James C. Hall

A Timely Message for Foundry Managements

MODERNIZATION
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AUTOMATION

Knight Engineering has assisted in the modernization, mechanization and automation of hundreds of foundries, here and abroad. These programs have increased production per man hour, established equitable rate structures and eliminated overtime. Specific programs are based on the individual requirements of the foundry and include the degree of modernization, mechanization and automation that is economically justified. Many projects permit direct labor and material cost reductions to amortize the investment in 2 or 3 years. Knight Professional Foundry Engineering is readily available to assist in planning your modernization program.

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SEES GROWING MAGNESIUM USAGE

Metal Enters Era of Marketing

● ABOUT nine out of ten major users of magnesium are highly optimistic concerning the future growth of markets for the lightweight metal, according to H. Y. Bassett, president, Calumet & Hecla Inc., Chicago.

Mr. Bassett, whose company has, with Brooks & Perkins Inc., Detroit, formed Alabama Metallurgical Corp., the nation's second producer of magnesium, spoke at the 15th annual convention of the Magnesium Association, Oct. 19-20, in New York.

James S. Kirkpatrick, vice president of research and development, Brooks & Perkins, stated that magnesium has come of age. The market research period is over, and the market development era has arrived, he said. Mr. Kirkpatrick cited a 352 per cent increase in use of magnesium since 1949 and summarized developments in some of the fields in which the metal has found acceptance during the last ten years.

Five technical papers presented at the meeting dealt with castings. They included the following:

Short-Time Elevated Temperature Properties of Premium Quality Magnesium Castings — Walter Gronvold, Aero-Space Div., Boeing Airplane Co., Seattle, Wash. The short-time elevated temperature requirements of missiles have made it necessary to establish design allowables for shorter times and at more rapid load rates than those used in conventional testing. Design allowable curves were prepared for four magnesium casting alloys.

To get more magnesium castings into missiles and aircraft, it is necessary to obtain a higher quality than indicated in existing specifications. The term "premium quality" has been selected to define this sort of casting. It covers adequate control of foundry variables; properly engineered feeding and risering; controlled use of chills; minimum porosity and microshrinkage; more rigid inspection; and more testing and development work.

The Philosophy Behind a Cast I-Beam Destruction Test Program —Walter Gronvold. A cast I-beam has been selected as a test vehicle to demonstrate premium quality magnesium castings. An I-section was chosen for these reasons: 1. It is a structurally efficient section. 2. The pattern is simple and inexpensive. 3. Such a casting is symmetrical and easy to test and to analyze. 4. It is a representative structural configuration which requires superior foundry technique to produce the quality desired.

It is intended to use this casting to evaluate processes and alloys, to study variations of properties within the part, to compare suppliers, and eventually to use it as a standard part for qualifying suppliers. A specially designed part for test evaluation appeared to be the best way to demonstrate that high-strength castings are attainable.

HK31 Castings Find Wide Use in Advanced Ramjet Engines — C. P. King, Marquardt Corp., Van Nuys, Calif. High strength of magnesium-thorium alloy HK31 at elevated temperatures makes it attractive to missile designers. At Marquardt, where HK31 castings have been used since 1952, application of the alloy to one advanced ramjet engine alone encompasses almost 70 castings which range in weight from 1 oz to more than 100 lb and are made by these methods: Green sand molding, permanent molding, investment casting, dry sand molding, baked core assemblies, and shell molding.

Chemical composition of HK31 is 2.5 to 4 per cent thorium, 0.5 to 1 per cent zirconium, 0.3 per cent maximum impurities, balance magnesium. This alloy has outstanding ability to perform at temperatures up to 900° F, and castings made of it also are orbiting the earth in the Discoverer satellite at more than 300 degrees below zero.

Development of Cast Magnesium Main Landing Gear Doors for the F-89 Airplane—A. J. Iler, Norair Div., Northrop Corp., Hawthorne, Calif. Airframe structures engineers are interested in the use of

Webster BUCKET ELEVATORS

for handling FOUNDRY SAND

WEBSTER Bucket Elevators can be supplied in practically any capacity. Made in centrifugal, perfect or gravity discharge, continuous bucket, and super capacity types. Buckets can be furnished malleable iron, duramal or steel.

WEBSTER Conveyors for sand, shot, molds, castings, refuse, etc. are widely specified by foundry engineering consultants and used by specialty equipment manufacturers in foundry mechanization programs. All components of WEBSTER equipment are manufactured and assembled in the Webster plant in Tiffin, Ohio.

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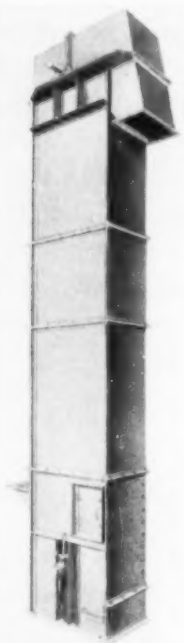

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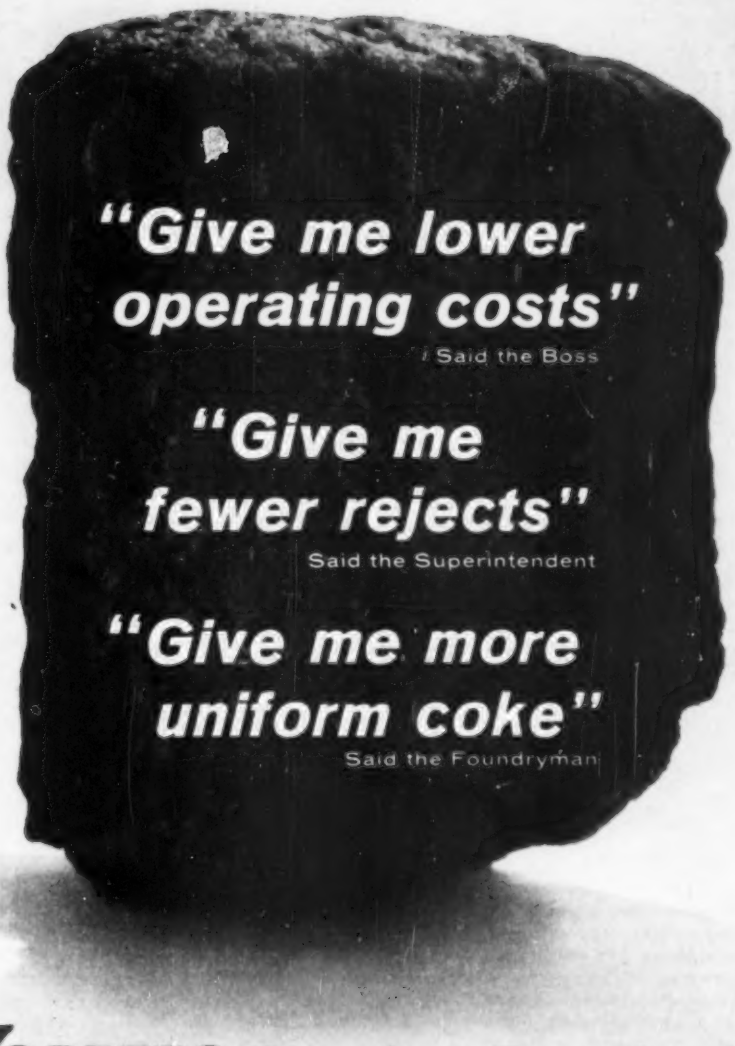

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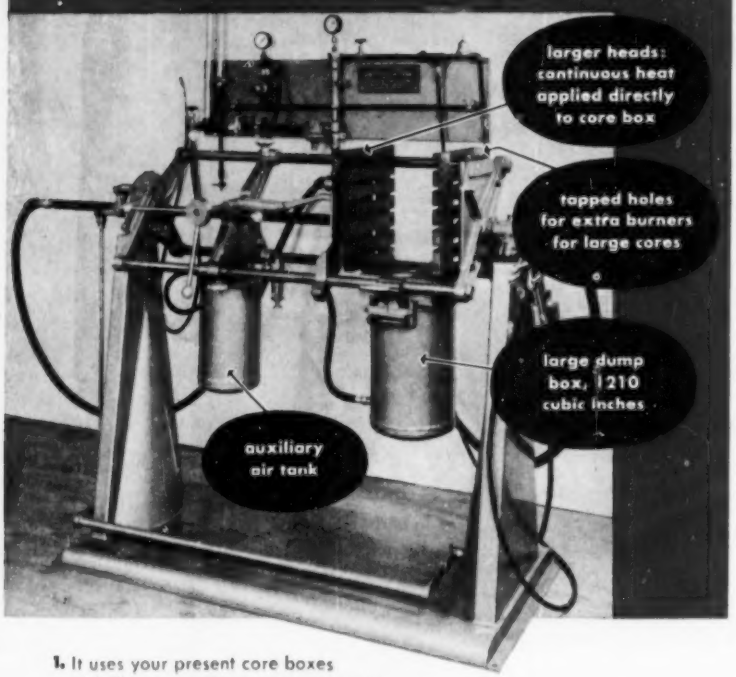
Premium quality foundry coke! That's exactly what Koppers delivers car-after-car. Made from the highest quality West Virginia coals, scientifically blended and baked the right length of time, Koppers Premium Foundry Coke is absolutely *uniform* in *size, strength, structure* and *chemical analysis*. With its higher carbon content, Koppers Coke enables the foundryman to maintain a higher temperature range, thus increasing the the cleanliness of the iron. This in turn, helps reduce fuel consumption and means lower operating costs all around. Next time *order* Koppers Premium Foundry Coke. Available anywhere in the U.S. or Canada in sizes to meet your needs. Koppers Company, Inc., Pittsburgh, Pa.

WE CHECK EACH DAY'S RUN to make certain you get foundry coke of the exact size and chemistry that is most efficient for the job. Analyses are available to your foundry on request.

Circle 679 on Page 53

The "200 SERIES"
'DEPENDABLE'
SHELL CORE
MACHINE


larger heads: continuous heat applied directly to core box
tapped holes for extra burners for large cores
large dump box, 1210 cubic inches
auxiliary air tank

1. It uses your present core boxes with little or no alterations necessary. No need to build new core boxes.
2. Continuous heat applied directly to back of core box. Thin sections most desirable. Fast and efficient.
3. Operates on any type of gas, natural, manufactured, mixed or bottled. Economical.
4. Quick change for short runs. Clamps provided.
5. Produces intricate small cores in four gang boxes at the rate of ten per minute, and cores up to 14" diameters or 30" lengths at the rate of one per minute.
6. Various thicknesses of core can be obtained by length of time invested.
7. Eliminates the need for driers or pasting.
8. Shell cores produced offer Unexcelled Permeability . . . Collapsibility . . . Accuracy . . . Easy Shake-Out.
9. Low initial cost . . . $1770, F.O.B. Portland, Oregon.
10. Your Dependable Shell Core Machine comes completely equipped with accessories and assembled ready to operate. Just hook up to gas and compressed air lines. Shipping weight, crated, 500 lbs.

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Utah Foundry Supply Co. *Salt Lake City, Utah*
Frank H. Jefferson, Inc. *Seattle 4, Wash.*
Sierra Foundry Supply Co. *San Gabriel, Calif.*
Shallway International Corp. *Los Angeles, Calif. and Crawley, England*
W. O. McMahon *Birmingham 9, Ala.*
La Grand Industrial Sup. *Portland, Oregon*
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Brandt Equip. & Supply Co. *Houston 21, Texas*
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Barker Foundry Sup. Co. *So. San Francisco, Calif.*

low-density cast magnesium for more extended airframe component applications. Northrop Aircraft Inc. (now Norair) was granted two Air Force research and development contracts for the development of a typical airframe structural unit which normally would be moderately stressed and would be broadly typical of counterparts on the majority of military aircraft. The main landing gear door was selected. Results indicate that there is no scientific reason why much larger than usual cast magnesium airframe components cannot be used, provided that reliability of product and source continue to develop proportionately.

An Analysis of Engineering Evaluation and Quality Assurance Criteria Developed from Structural Tests of Magnesium Sand Castings —T. C. McGill, South Gate Aluminum & Magnesium Co., South Gate, Calif. Static destructive tests were conducted on three structurally classified airframe magnesium castings. Purpose was to establish greater understanding of the potentials of castings in terms of engineering, quality assurance, and economics.

Results indicate that cast airframe components offer the same economic advantages as they have previously, although some types of structures now produced do not lend themselves to the casting process. The reduction of cast product costs can be accomplished and passed on most effectively through more critical analysis of castings' service ability. This ability can be determined best by destructive tests.

"Straight as an arrow. Now let's try for accuracy"

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Blast cleaning is admittedly a job of many variables, hard to keep on an even keel. Involved in economical blast cleaning are such things as good housekeeping, good control over equipment and, of course, good shot and grit. Many blast cleaning troubles develop, because the characteristics of many abrasives vary with each shipment!

NATIONAL has developed its ability to give you abrasives with controlled characteristics ton after ton after ton. This eliminates the *one* variable over which you have no control and makes possible staggering savings. Cost-conscious customers have enjoyed this NATIONAL advantage for over a decade!

Exactly what is YOUR application? Are you using steel? **PERMABRASIVE**® can save money through faster cleaning and lower costs per ton. Are you using an ordinary annealed abrasive? **PERMABRASIVE**® can save money through faster cleaning, minimum graphitic carbon content, and longer life, because of a low phosphorus content. Are you using chilled? **CONTROLLED "T"**® can save money up to 50% on consumption and up to 40% on maintenance costs, because of its controlled BHN: an iron fist (for the product to be cleaned) in a velvet glove (to be kind to blast cleaning machinery). Have you a tough, individual problem? NATIONAL'S metallurgists KNOW what it takes to reach an objective and KNOW how to produce a custom-made abrasive for a specific job!

We're not just talking to hear our own voices. Everything can be proven to you in your own plant under your own conditions as it has in thousands of other cases—without an operation-disturbing test. Try us!

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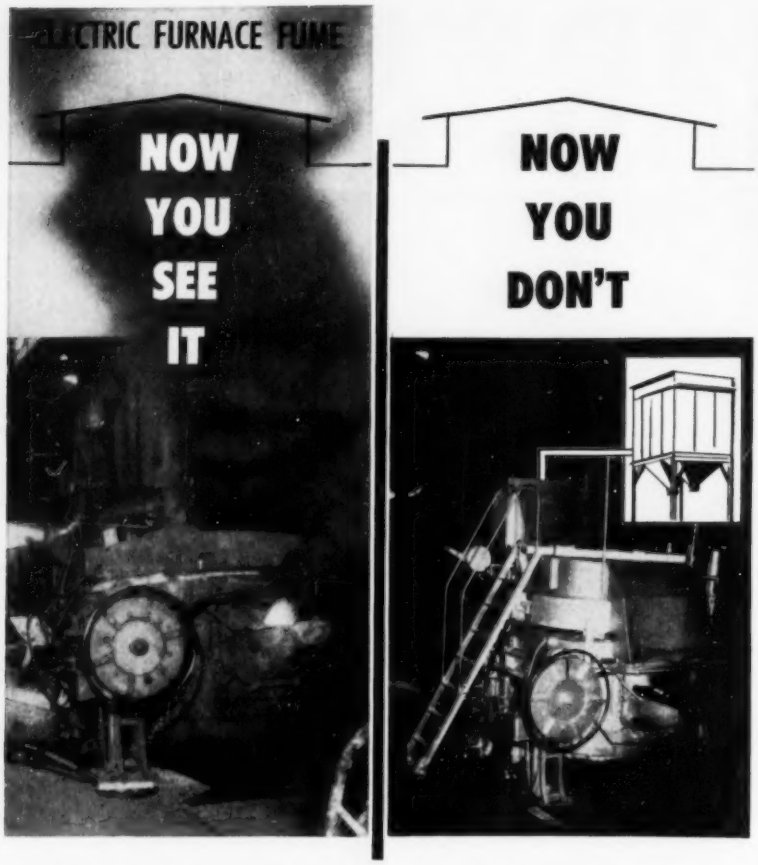
Circle 681 on Page 53



Wheelabrator® Dustube® Collectors guarantee a discharge free of visible solids

- Guaranteed to meet all applicable air pollution codes, if operated according to recommended procedures.
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For our new dust control guide book and complete information on Wheelabrator Dustube systems in controlling electric furnace fume write to: **Wheelabrator Corp., 505 S. Byrkit St., Mishawaka, Indiana. In Canada, write to Wheelabrator Corp., Canadian Div. P.O. Box 490, Scarborough, Ontario.**

A sound-color film on electric furnace fume control is available for showing to interested groups.

WHEELABRATOR
DUST AND FUME CONTROL

Obituary

E. O. Beardsley, 72, a founder and former president of Beardsley & Piper Co., Chicago, died Oct. 15. With W. F. Piper he owned Klamath Falls Iron Works, Klamath Falls, Oreg., where the sandslinger was developed. When the plant was destroyed by fire in 1918, the partnership was established in Chicago as Beardsley & Piper Co. Mr. Beardsley was a former director of Foundry Equipment Manufacturers Association and of the American Foundrymen's Society.

Walter J. Temple, 55, since 1946 works manager, K. O. Steel Castings Inc., San Antonio, Tex., died Sept. 30. When the company was organized in 1938 he was named

WALTER J. TEMPLE

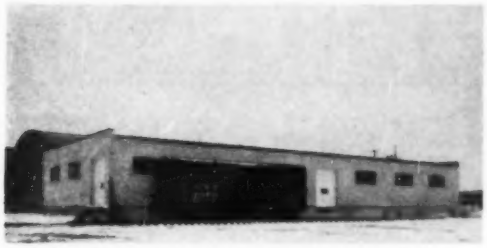
superintendent. Previously he was with Temple Foundry and Alamo Iron Works, San Antonio.

Bernard Drewes, 81, until his retirement in 1952 works manager, Zenith Foundry Co., Milwaukee, died Oct. 6.

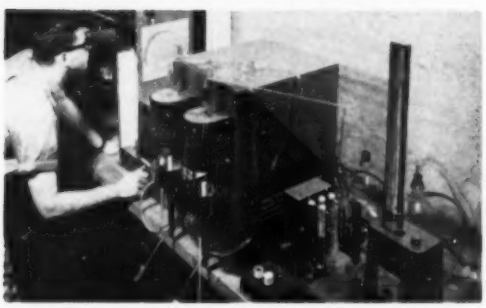
R. A. Haddock Jr., 82, for 27 years prior to his retirement with Beaver Valley Alloy Foundry Co., Monaca, Pa., died Nov. 4, in Shadyside, Pa.

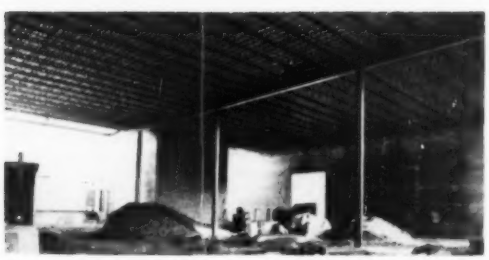
Alfred W. Hammer, 55, sales manager, Durez Plastics Div., Hooker Chemical Corp., Niagara Falls, N. Y., died in New York, Nov. 10. He joined Durez in 1929 as a sales engineer.

Circle 682 on Page 53



ANOTHER CMA IMPROVEMENT IN THE PRODUCTION OF METALLIC ABRASIVES





We are maintaining consistent improvement of our facilities, with one thing in mind . . . providing you with the best possible line of Persuasive Abrasives at the best possible price.

Evidence of this can be seen here.

The new Toledo addition is completed, providing us with necessary additional shipping room and better flow of basic materials.

Our new laboratory at Cleveland is complete and functioning in the direction of closer quality control.

Most importantly, ground has been broken on our new 16,000 square foot Cleveland addition. This will house electric melting furnace facilities producing 12,000 pounds of finished steel per heat. Other equipment includes modern conveyors, heat treating furnaces, tanks, and crushers.

All of these improvements add up to further your confidence in CLEVELAND as a central source for all types of metallic abrasives.

For further details, call in our nearby representative or send for our Catalog No. 159.

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World's Largest Production Capacity Teletype: CV 901

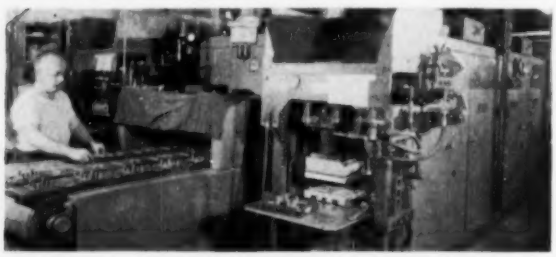
Circle 683 on Page 53

The Shakeout

Dielectric Core Oven Cuts Production Costs

INSTALLATION of a dielectric oven to bake small cores reportedly has enabled Dick Bros. Inc., Reading, Pa., to improve product quality while reducing space and manpower requirements. The oven uses two Allis-Chalmers 25-kw dielectric heaters as its source of heat energy power.

In the heaters, 60-cycle electric power is changed



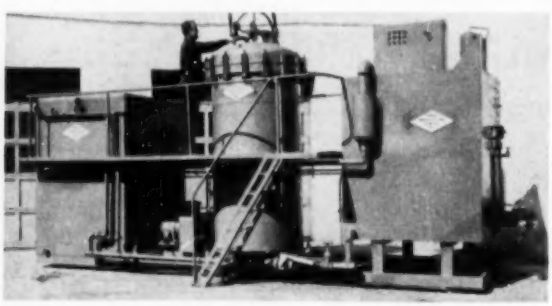
to dc by the rectifier section and converted by the oscillator section to high-frequency power which is carried directly to the oven. This system is said to reduce baking time, eliminate cooling time, and improve core quality. Fuel costs are cut because preheating is not required, and only one heater need be operated during reduced production.

Illustration shows the infeed end of the oven. Heights of cores shown range from ½ to 3 in.; weights range up to ½ lb.

For More Details Circle No. 517—Page 53

Leases Batch-Type Impregnation Units

CUSTOM-BUILT RENTAL unit for production-line impregnation of aluminum automotive transmission housing castings features a separate electronic control panel which automatically phases the impregnation cycle and includes a foolproof electrical interlock system to prevent entry of the liquid sealing



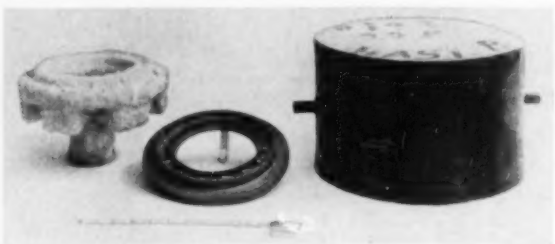
material. Designed specifically for use with metal-oxide type sealing materials, the unit was produced by Prenco Mfg. Corp., Royal Oak, Mich. It consists of an 850-gal sealant supply tank, a sealant agitator, an autoclave, and 1000-gal rinse tank, with sealant heating system, vacuum pump, and all electrical and hydraulic piping and controls.

The equipment is built as a package unit, can be readily moved and installed completely, is economical and sturdy. It can handle 70 large castings per hour at a cost of less than 2 cents each.

For More Details Circle No. 518—Page 53

Ceramic Shells Improve Investment Casting

CASTING OF MANY aircraft and missile parts with speed, economy, and precision is accomplished with a ceramic shell investment casting process developed by Ferro Cast Div., J. B. Rea Co., Santa Monica, Calif. The process employs the basic techniques of flask in-



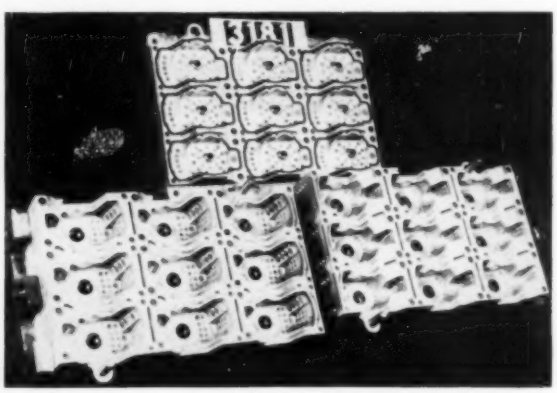
vestment casting, but replaces the investment-filled steel flasks with a thin, strong, coating surrounding the disposable wax patterns.

Illustration shows a shell, left, used to cast a turbo-pump nozzle and an investment-filled flask of the type formerly used, right. Shell weighs 5 lb; flask weighs 85 lb.

For More Details Circle No. 519—Page 53

Nitrile Rubber Seal Prevents Corebox Blow-By

A TOUGH, EFFECTIVE seal of Hycar nitrile rubber is used in a method of sealing coreboxes which has been developed and patented by Dike-O-Seal Inc.,

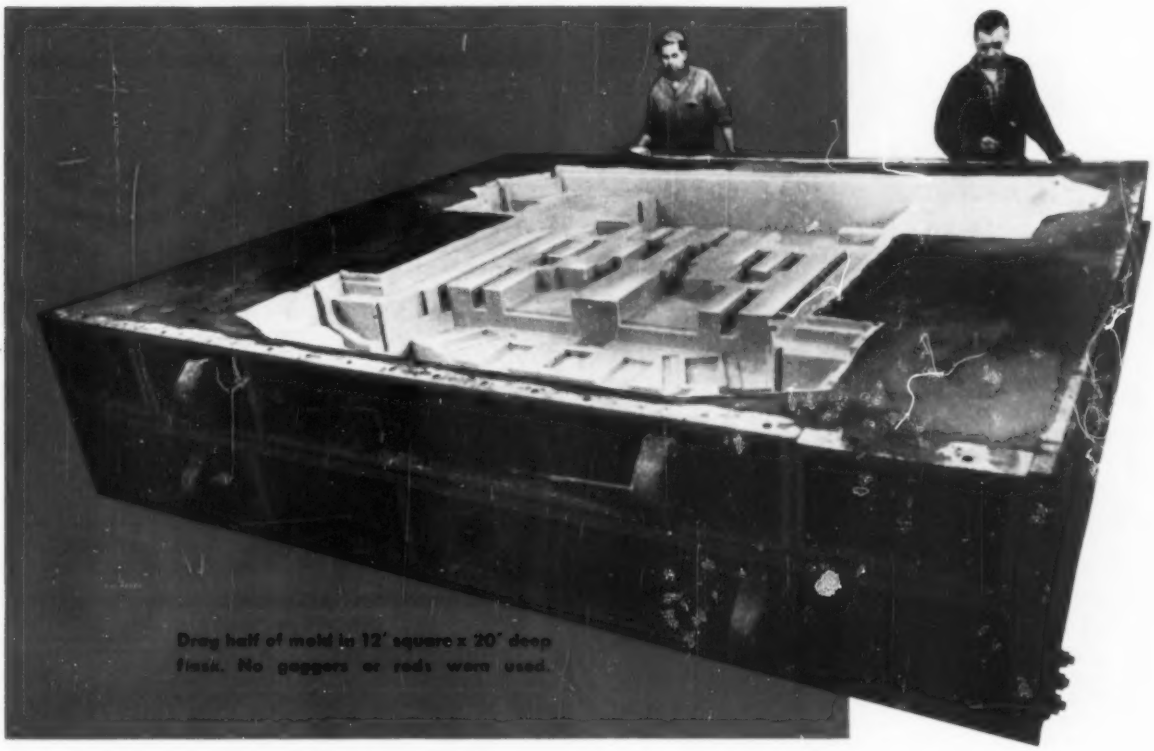


Chicago. The seals are said to be flexible enough to fit the outlines of complicated contact faces, yet tough enough to resist live steam, alkali, and fuel oil used during the cleaning of coreboxes. The rubber was developed by B. F. Goodrich Chemical Co. and is able to withstand extreme temperature changes and severe mechanical deformation and has unusual abrasion resistance.

For More Details Circle No. 520—Page 53

SPECTACULAR RESULTS

in casting automotive dies

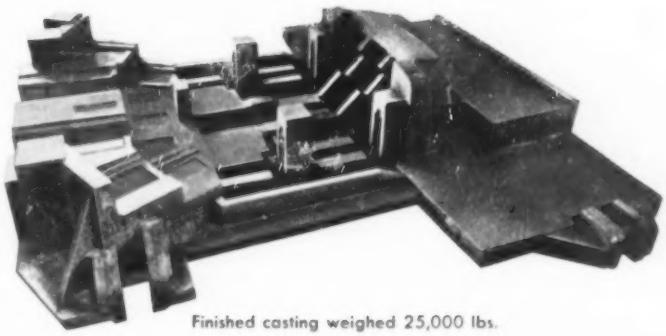


Drag half of mold is 12' square x 20" deep finish. No gaggers or rods were used.

Schneider, Bowman Co., Inc. of Philadelphia is using Kold-Set Binder to achieve significantly improved dimensional accuracy in the production of die castings for the Budd Co.

In the casting shown, considerable machine time was saved due to close tolerances maintained in the making of the casting. The management at Schneider, Bowman Co., Inc. reports a 25% reduction in mold dressing time. Additional savings were realized in mold making in excess of 10%. 2% Kold-Set and 1½% iron oxide were used with 7,000 lbs. of sand. Before drying the mold received two coats of Kold-Set Zircon Wash. No oven baking needed, the mold being dried with a portable heater for eight hours at 450°F.

Let us discuss how the Kold-Setting Binder Process can reduce costs and improve dimensional accuracy of castings for you. *Write or phone!*



Finished casting weighed 25,000 lbs.

Write for Kold-Set Application Studies

Let us send you this new quarterly publication which shows how the Kold-Setting Binder Process is being used by progressive foundries.

KOLD-SET

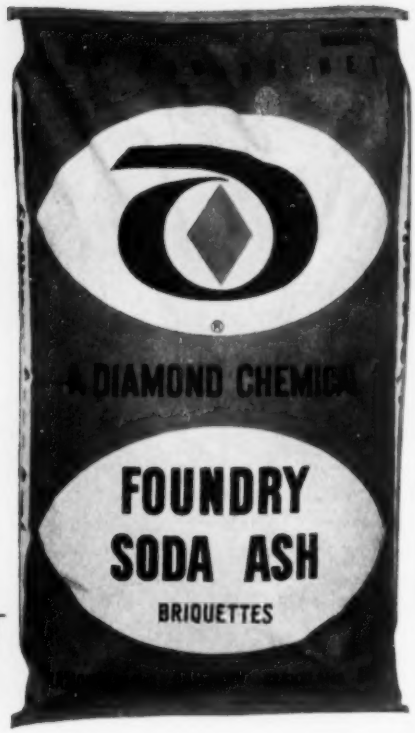
PRODUCTS FOR FOUNDRY PROGRESS

G. E. SMITH, INC.

246 Washington Road Pittsburgh 16, Pa.

Warehouse Stocks in Chicago, Boston, Detroit, Philadelphia

Kold-Set is Patented in the United States



NEW

DIAMOND FOUNDRY SODA ASH BRIQUETTES

for fast, efficient, desulphurizing action

No inactive ingredients to add to cost. Pillow shaped for easy handling and fast, efficient desulphurization of molten metal in cupola or ladle. Diamond Foundry Soda Ash Briquettes permit greater use of scrap metal in melting, release entrapped gases and increase fluidity. Tough, moisture-proof 100-lb. bags keep them dry, effective and safer to use.

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better ... best

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HERE'S WHY:

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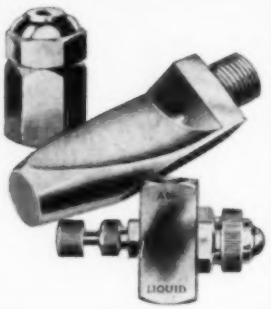
Your inquiry is invited.



SPRAYING SYSTEMS CO.
3238 Randolph Street
Bellwood, Ill.

For complete spray nozzle information write for Catalog 24.

Circle 686 on Page 53

FOUNDRY

EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

MECHANIZATION

Circle 687 on Page 53

EMPIRE*

"THAT GOOD"
FOUNDRY COKE

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Phone: ALpine 1-9135
*Reg. U.S. Pat. Off.

Circle 688 on Page 53

Circle 685 on Page 53

HIGH PRODUCTION, PERFECT STRAIGHTLINE OPERATION

"OLIVER" No. 94-DH HYDRAULIC 'STRAIGHTLINE' CUT-OFF SAW

Suspended accurate link motion guarantees perfect straight line operation. Machine carries saws from 14" to 20" diameter. Operates at high production rate. Saw with its guard is housed inside of main column when not in use. Send for folder giving details.

OLIVER MACHINERY COMPANY

Grand Rapids 2, Michigan

Circle 689 on Page 53

Let us know your specifications on welded constructions. We have up-to-date facilities for production of carbon or stainless steel and aluminum, from 1/16" to 4" thick.

Call or write for estimate. You'll find it economical to work with us on your requirements for tanks, chutes, hoppers, machine bases, stacks, breechings, angle rings, special cars, buckets and other equipment.

PENN IRON WORKS, INC.
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Circle 690 on Page 53

SCIENTIFIC

***GEFSCORP**
Pressure Cast

MATCHPLATES

HOLDS LIKE A VISE TO PREVENT MOLD SHIFT* FROM CONVEYOR LINE JOLTS OR ROUGH HANDLING

WHY NOT SAMPLE TEST THEM ?

THE SCIENTIFIC CAST PRODUCTS CORP.
1390 E. 40th, Cleveland — 2520 W. Lake, Chicago

*M'f'd under license from General Foundry Services Corp.

Circle 691 on Page 53

CALL

BECKER

... for Graphite Particles of Any Mesh

Graphite Powder or Particles of any size with the highest obtainable percentage of pure fixed soluble carbon to meet your specifications for carbon content control in steel making and ferrous metal casting.

... for Graphite Cores and Chills

Solid Graphite in round, square or rectangular shapes for cores and chills in all practical dimensions. Special fabrications to your specifications . . . standard sizes from warehouse stocks—one piece or a carload.

BECKER Has it or can Make it if it's CARBON or GRAPHITE!

BECKER BROTHERS CARBON CO.
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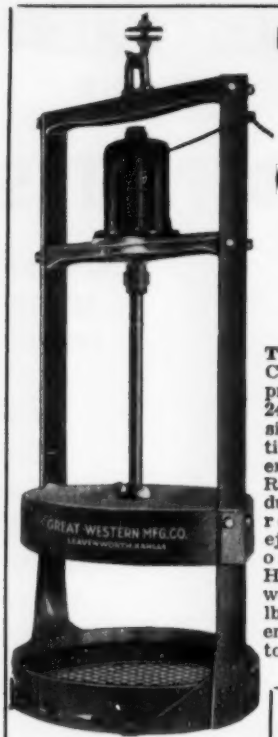
Circle 692 on Page 53



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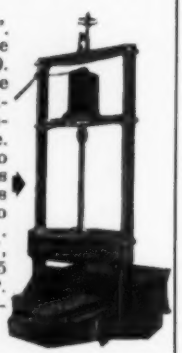
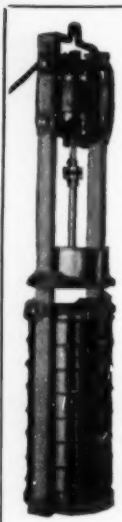
COMBS GYRATORY RIDDLES

"Greatest Name in Motion"



TYPE "CS". Complete price $395.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ½ H.P. enclosed motor.

TYPE "CR". Complete price $385.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.



TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20" Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $545.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas **Phone MU-22291**
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CENTRIFUGAL CASTING
INCREASES PRODUCTION

You can save as much as 25% in labor costs while increasing your production as much as 35% by making castings centrifugally. Highest quality castings, a minimum of rejects, and use of unskilled labor contribute to more profitable operation. It will pay you to ask for complete information.

CENTRIFUGAL CASTING MACHINE COMPANY
P. O. BOX 947 TULSA 1, OKLAHOMA

Circle 694 on Page 53

BURR ALUMINUM BOTTOM BOARDS
IMPROVE CASTING QUALITY

STURDIEST POSSIBLE MOLD FOUNDATION

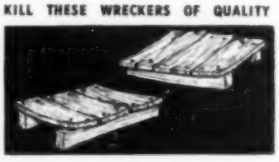
- Can't Warp, Swell, Twist, Burn or Come Apart
- Eliminates Cracked Molds—reduces rejects
- Strong—Rigidly Bridged—Lightweight—One Piece

Better castings are produced on Burr Aluminum Bottom Boards with fewer rejects caused by cracked molds, swells and inadequate venting.

240 STOCK SIZES assures QUICK DELIVERY

Write Today for prices and samples

KILL THESE WRECKERS OF QUALITY



BURR ALUMINUM PRODUCTS
P. O. BOX 61 BURR OAK, MICHIGAN

Circle 693 on Page 53

Circle 695 on Page 53

CLASSIFIED ADVERTISING

• HELP WANTED

FOUNDRY TECHNOLOGIST

To conduct development research and foundry service facilities in rapidly growing field. Principal activites directed to development of green sand molding compositions. Experience in basic foundry practice desired with knowledge of chemistry or chemical engineering. Please send resume to:

PERSONNEL MANAGER
BAROID DIVISION, NATIONAL LEAD COMPANY
BOX 1675
HOUSTON, TEXAS

HIGH ALLOY CASTINGS—SALES ENGINEER

Challenging opportunity to develop sales of new division producing heat and corrosion resistant castings for well established steel foundry.

Engineering degree, sales experience, and metal industry or foundry background required.

Fine living and recreational advantages.

Send complete resume, including salary requirements, and photo if possible, to:

W. E. NIEMACKI,
MINNEAPOLIS ELECTRIC STEEL CASTINGS CO.
3800 N.E. 5th St.
MINNEAPOLIS, MINN.

SUPERINTENDENT—GRAY IRON FOUNDRY

Good salary, plus profit incentive, to man who can satisfactorily operate a very modern, gray iron foundry. Well established, growing organization, presently employing about 75 people. Located in Cincinnati area. Write, stating why you feel qualified, to:

BOX 809, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRYMAN

Man wanted to take charge of finishing operations of a leading steel foundry located in California. The man we want must have leadership ability. He must assume full responsibility and be capable of planning and following through with a cost reduction program.

BOX 828, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERVISOR

For pouring and shake-out department of mid-west steel foundry. Experience required with bottom pour and small monorail ladles. In reply give personal history and industrial experience. Address: Box 844, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Research and technical Director for gray iron foundry southeast Wisconsin. Must be college graduate under 40 years and experienced, and a desire to remain in the foundry industry. Excellent opportunity. Address: Box 823, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN

Steel foundry. Experienced carbon and stainless steel castings up to 2000 #. Quality production—valves, pumps, etc. CO_2 and special sands. Located Eastern Pa. Address: Box 802, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT TO METALLURGIST

To work in melting, sand control, heat treatment, etc. State experience and salary expected. Mid-West Malleable Iron Foundry. Address: Box 829, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

OPENING FOR QUALIFIED PERSONNEL

Large steel foundry, located in Michigan, urgently in need of qualified personnel with experience in investment and ceramic molding. Metallurgical experience a necessity. Write giving full resume.

BOX 811 FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PERMANENT MOLD ENGINEER

Practical permanent mold engineer and foreman with experience in magnesium and aluminum. Must be able to engineer and design molds and follow through necessary production operations.

BOX 826, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

B.S. Degree. Recent graduate with up to 3 years experience preferred. Duties would include supervision of Applied Research on projects related to nonferrous investment castings. Plant located in New England. Salary commensurate with qualifications.

BOX 839, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY MANAGER

Responsible for all melting and molding operations in jobbing iron foundry. Supervision of foremen and production. Castings 1 lb. to 10 tons. New York area.

BOX 840, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRYMAN

Experienced man to take complete charge of making large specialty aluminum castings. No. production work. Soundness of castings of prime importance. Ideal position for competent man who does not want headaches of large foundry. Only qualified man with successful record need apply. Submit resume to:

SPRINGFIELD CAST PRODUCTS, INC.
124 SWITZER AVENUE
SPRINGFIELD, MASS.

METALLURGIST

B.S. degree Metallurgical Engineering required. Must have had several years experience in gray iron foundry, and be thoroughly versed in cupola operation and qualified to head Melting Department in a large mechanized foundry. Midwest location. Submit complete resume on education and experience, also salary requirements. All replies held in confidence.

BOX 832, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY ENGINEER

With Executive Ability, experienced on layout of all types of foundry equipment, material handling and material flows. Send complete details on work history, education. Age 32-48.

BOX 820, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• HELP WANTED

METALLURGIST

Wisconsin gray iron foundry, a leader in the field, and pouring 175 to 200 tons daily, requires a chief metallurgist capable of taking complete charge of its metallurgy and melting departments. Laboratory includes a spectograph and other modern metal and sand control equipment. Plant has twin cupolas with mechanical charging. Plant is located in small city offering all the advantages of suburban living. The company offers liberal benefits, including the profit-sharing premium plan. Please provide complete background in first letter, including references and salary desired.

BOX 827, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ENGINEER-DESIGNER

Opportunity for man with substantial experience in design and layout of modern foundry materials handling equipment. Degree and professional registration desirable, but not necessary depending upon experience. Send complete information and photograph. All replies confidential.

BOX 814 FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

RESEARCH ENGINEER

Excellent opportunity in progressive foundry for right man, supervising sand and quality control. Mechanized foundry making gray iron, ductile iron and ni-resist. Located in central Indiana. Position offers opportunity for advancement. Age 25 to 35 years. Telephone Westfield, Indiana, 3-3285 between 7:00-9:00 P.M.

BOX 819, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Have you practical experience and technical knowledge and ability to be a key man in this nonferrous foundry in western New York? Unusual technical equipment—specialized in high strength aluminums and bronzes—small and aggressive—a special situation for the right man.

BOX 816, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY TRAINEE

College graduate with metallurgical degree and 2-3 years practical experience in brass foundry. Excellent opportunity for advancement in large captive plumbing brass foundry. Work area includes sand testing, core making, molding and casting cleaning. Address: Box 810 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GREEN SAND FOREMAN

Qualified and progressive foreman desired in jobbing green sand department manufacturing light and medium sized castings. Must know mounting of jobs for squeezer molding and be able to handle men. Well established iron foundry in northern Ohio. Address: Box 837, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM FOREMAN

Gray iron jobbing foundry in Michigan seeking working foreman with experience in floor and bench work. To be in charge of 5 men. Address: Box 812 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT FOUNDRY MANAGER

Opportunity for assistant foundry manager for large high production brass and aluminum foundry. Midwestern location. Thorough practical experience with some metallurgical training required. Address: Box 834, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

BARNEY GAXIOLA

"Please contact Pat Lioi, GEneva 18596. Very urgent." Signed: Wm. J. Hanson, 5120 Long Beach Blvd., Long Beach 7, Calif.

CHIEF INSPECTOR

Experienced in steel foundry. We produce medium and large castings. Address: Box 807 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

MANAGER—SUPERINTENDENT

TWENTY FIVE YEARS EXPERIENCE ALL PHASES OF MANAGEMENT FERROUS AND NONFERROUS, CAPTIVE AND JOBBING. CAPABLE OF COMPLETE CHARGE. CURRENTLY EMPLOYED BUT DESIRE CHANGE. BEST INDUSTRY REFERENCES. ADDRESS: BOX 842 FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

CORE ROOM SUPERVISOR

Twenty five years experience in gray iron and steel. Twenty years in core room supervision, on jobbing and production, bench, roll over and blowers. Good labor relations. Qualified to take complete charge of core room. Any location. Address: Box 843, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 838, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PRODUCTION MANAGER—SUPERINTENDENT

Twenty-three years practical experience steel foundry production. Fully qualified to take complete charge of foundry production department. 40 years of age. Presently employed. Address: Box 849, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL FOUNDRY ENGINEER

Wants executive position of responsibility. Graduate engineer with 10 years experience in all phases of steel foundry operations. Presently employed. Address: Box 821, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CHIEF OF PRODUCTION—ASSISTANT TO THE PRESIDENT

Do you need someone to make money for your company? I am experienced in labor contracts, production methods, and "know-how" and will carry out your suggestions or orders profitably. Complete resume available. Address: Box 825, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT-MANAGER

Practical and technical foundryman with broad experience in ferrous and nonferrous jobbing and production foundries. Good trouble shooter. 20 years experience in every phase of the foundry. Age 47, now employed. Address: Box 831, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Young foreman with background in steel and iron desires position in core room or molding department. Four years apprenticeship and journeyman previous to supervisory work. Willing to relocate. Address: Box 846, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT

Aggressive practical gray iron foundryman, technically trained production jobbing, 30 years extensive, detailed and diversified foundry experience producing quality at min. costs. Age 55. Address: Box 835, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

QUALITY CONTROL

Nonstatistical, fewer charts, and more action through unitary approach. Gray or malleable iron with established sand and metal control systems. One year contract desired. East or mid-west preferred. Address: Box 841 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PATTERN SHOP SUPERINTENDENT

With 32 years of pattern shop supervision including 20 years operating own job shop, employing 8 to 12 wood and metal patternmakers, and was able to solicit, quote and supervise the construction at a profit. Address: Box 801, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• EMPLOYMENT SERVICE

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **FINANCIAL 6-8700**
JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

• POSITIONS WANTED

COREROOM SUPERINTENDENT

Or General Coreroom Foreman. 19 years experience in gray iron foundry. Age 41. Married with family. Jobbing or production, bench or floor work. Qualified to take complete charge of all coreroom operations. Willing to relocate. Address: Box 824, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Broad 20 years experience, including basic cupola ductile, metal, casting and sand control, age 48, will relocate. Available. Address: Box 833, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Twenty-five years as superintendent and manager. Experienced in all phases of foundry management, as well as centrifugal casting, stack molding, and both direct arc and induction furnace melting. Address: Box 848, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

SALES REPRESENTATIVES

Here is an established competitively-priced line you can count on for a good income. Milward Alloys, a leading manufacturer with a strong reputation is now in the process of localizing many sales areas to give better service to customers and prospects from coast to coast. A considerable number of territories are open. We need men who will take them on, full or part time.

You may now be serving the trade or you may have foundry experience. Maybe you're retired with time on your hands. Regardless of your situation, you will be amply rewarded—because Milward's line is broad and in constant demand. Milward alloys cut foundry costs. Orders are promptly filled. That's why we have a substantial reorder business.

The Milward line includes: copper shot; phosphor copper and other powerful deoxidizers and degasifiers; aluminum bronze and manganese bronze hardeners and ingots; copper silicon, copper manganese, copper iron, copper aluminum and copper chrome alloys; nickel copper and nickel iron alloys; aluminum titanium, aluminum silicon, aluminum manganese, aluminum iron and aluminum copper and other alloys.

Phone or send us a letter describing the area or locality you can cover, whether full or part time, and tell us a little about yourself . . . your qualifications, experience, and when available. This may well be the connection you've been waiting for. Write or phone: Mr. David B. Milward, President. Phones: Lockport, N. Y. 4-0435, or Buffalo, N. Y. LUdlow 6425.

MILWARD ALLOYS, INC.
Lockport, N. Y.

SALESMAN

Wanted salesman that sells foundry supplies to handle molten metal thermocouples and pyrometers for nonferrous foundries. Good commissions and unlimited territory. Well-established instrument manufacturer.

ELEMATIC EQUIPMENT CORPORATION
6731 SOUTH CHICAGO AVENUE
CHICAGO 37, ILLINOIS

• REPRESENTATIVES WANTED

SALES REPRESENTATIVE

Leading foundry supply house needs sales representative for Eastern Pennsylvania. Should be experienced in handling sale of complete line of foundry supplies and equipment.

This is a good opportunity for an aggressive salesman. He will be handling nationally advertised products that have won acceptance in leading foundries.

Send a complete resume of experience and salary requirements. Your reply will be kept strictly confidential.

BOX 830, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

MANUFACTURERS REPRESENTATIVES

Large nonferrous foundry located in New Jersey has open time for aluminum-bronze-magnesium castings. Commercial and aircraft quality. Electronic, waveguide and airborne parts to close tolerances. Commission basis. Address: Box 808 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANUFACTURER'S REPRESENTATIVES

Manufacturer of industrial ovens and furnaces needs representation in these areas: Texas, Missouri, Illinois, Minnesota, New York, and Michigan. Carl Mayer Corporation, 20800 Center Ridge Rd., Cleveland 16, Ohio.

• REPRESENTATIVES AVAILABLE

FOUNDRY SALES REPRESENTATION

Aggressive young man, 30, five years foundry sales experience, (grinding wheels) has opportunity to diversify. Would like to handle two or three additional foundry items, giving specific product concentration. Presently covering southeast from Birmingham. Best references. Address: Box 817, FOUNDRY, Penton Bldg., Cleveland 13, 13, Ohio.

SALES REPRESENTATIVE

Experienced foundry supply and equipment sales representative desires Michigan territory. Fifteen years technical and practical background in steel and iron foundry supervision. Address: Box 847, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRY CONSULTANTS

FOUNDRY CONSULTANT-NONFERROUS

Sand casting—permanent mold casting—centrifugal castings — in aluminum — brasses — bronzes —30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, 286 PENOBSCOTT BLDG., DETROIT 26, MICHIGAN. PHONE: WOODWARD 5-7947.

• ENGINEERING SERVICE

Designed and Gated
MAGNESIUM PERMANENT MOLDS

Address inquiry to:

BOX 815, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• OPPORTUNITY

PERMANENT MOLD METHOD AVAILABLE THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and non-ferrous metals and invites inquiries from any country regarding this method and process.

• FOUNDRIES WANTED

WANTED

We would like to purchase gray iron, malleable or steel foundry. Must have sales from 20 to 50 tons per day. Prefer Ohio location, near or around Cleveland. Will consider others. Equipment and building unimportant as long as good sales volume exists. Will pay cash or trade for stock on New York Stock Exchange. Address: Box 845, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRIES FOR SALE

FOUNDRY FOR SALE

Fully equipped now operating gray iron foundry in western New York State for sale. Located near the New York Power Development. Reason for selling, present owners want to retire.

BOX 836, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• FOUNDRIES FOR SALE

FOR SALE OR LEASE

Gray iron foundry completely equipped and ready to operate. Large building, approximately 25,000 sq. feet, brick construction. Capacity 45 tons per day. On Sante Fe railroad, 200 miles south of Denver in Trinidad, Colorado. Address: Box 803, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ALUMINUM AND BRASS FOUNDRY

For sale. Fireproof building 7200 sq. ft. In profitable operation, bluechip customers of long standing. Vicinity of Milwaukee, Wisconsin. Address: Box 822, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• WANTED-TO-BUY

WANTED TO BUY

Clearfield #404 Muller 4 cu. ft.
Simpson #0 Muller Style "C"
Simpson #1½ Muller Style "C"
Milwaukee Jolt Fin Lift 30x60 Table
Osborn #712 PJ Jolt Squeeze Pin Lift
Tabor rollover 30x40 Table 12" Draw Air Clamps
Tabor Jolt Hand Rollover 20x22 Table
Tabor 5 HP Abrasive Cut Off Saw
Tabor 10 HP Abrasive Cut Off Saw
Redford #2 Core Blower w/air clamps
Demmler #1 Core Blower (New)
I-R 10000 lb. Air Hoists
I-R Air Trolley for 10000 lb. Hoists
Lindberg 6' x 8' x 8' Al. Heat Treat Furnace complete with controls, etc.
We will buy one piece or a complete plant.

PEK MACHINERY CO.
114 COLDEN ST.
JERSEY CITY 2, N. J.
HE 2-2898

IF YOU OPERATE

A FURNACE

We will purchase your scrap linings, retorts, conveyors, muffles, racks, etc. Any item made of nickel alloy.

Write, Wire or Call:

WEINSTEIN COMPANY
610 W. 8th STREET
JAMESTOWN, NEW YORK
PHONE: 61-154

MIXER WANTED

Used Simpson Intensive Sand Mixers, State size, condition and lowest cash price for immediate acceptance. Address: Box 818, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• WANTED-TO-BUY

WANTED-TO-BUY

We have immediate need for the following:
Osborn and Spo Jolt Squeese Molding Machines
Simpson Sand Mixers, all sizes
American Wheelabrator Tumblasts, all sizes
Melting Equipment of any type and size

call — write — wire today!

UNIVERSAL MACHINERY & EQUIPMENT CO.
1632 N. NINTH ST., READING, PA.
Phone Franklin 3-5181

WANTED

27" x 36" American Wheelabrator and dust collector to be used on 3 ph—220 V—60 cycle. Give age, serial number, and condition.

BOX 805, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED

B&P Motive Jr. Sand Slinger. Late type

BOX 806 FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED

2 used cranes—15 ton capacity hoist—30 ft. lift—38'7" span—wheels to run on 35 lb. rail—3/60/220—AC current. Maximum wheel load 25,000 lbs. 125 ft minimum trolley speed. 25-300 ft. min. bridge speed—magnetic controls. 25-30 ft. min hoist speed. Mail complete description and offer to: J. A. Graham, The Dayton Steel Foundry Company, P.O. Box 1022, Dayton 1, Ohio.

WANTED

Used or Broken Silicon Carbide Grinding Wheels of any kind or size, regardless of bond. Will pay $35.00 per ton. Union Mining Co., 1st Nat'l. Bank Bldg., Pittsburgh 22, Pa.

WANTED

One (1) used Davenport Model 28A, Jolt Rollover, Draw Machine 1500 lb. capacity size 444 plate. Address: Box 813 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING RATES

(Effective Jan. 1, 1960)

POSITION WANTED—Minimum advertisement set solid.

30 words or less $4.00
Additional words ..... 15c each.

ALL OTHERS—Help Wanted, Employment Service, Wanted-To-Buy, Representatives Wanted, For Sale etc. minimum advertisement set solid,

30 words or less $10.00
Additional words ..... 35c each.

NOTE: If replies are to be sent to a box number in care of FOUNDRY, add 8 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

Classified forms close the 13th of month preceding issue.

FOUNDRY

PENTON BUILDING CLEVELAND 13, OHIO

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Nine Times	Twelve Times
1 inch	$ 27.75	$ 26.25	$ 24.75	$ 24.00	$ 23.25
2 inches	54.00	51.00	48.00	46.50	45.00
3 inches	78.75	74.25	69.75	67.50	65.25
4 inches	102.00	96.00	90.00	87.00	84.00
5 inches	123.75	116.25	108.75	105.00	101.25
6 inches	144.00	135.00	126.00	121.50	117.00
7 inches	162.75	152.25	141.75	136.50	131.25
8 inches	180.00	168.00	156.00	150.00	144.00
9 inches	195.75	182.25	168.75	162.00	155.25
10 inches (1 col.)..	210.00	195.00	180.00	172.50	165.00
15 inches (1/2 page)	303.75	281.25	258.75	247.50	236.25
20 inches (2/3 page)	390.00	360.00	330.00	315.00	300.00
30 inches (1 page)	562.50	517.50	472.50	450.00	427.50

Remittance should accompany advertisement when submitted —Cash Discount 2%, 10 days.

• FOR SALE

FOR SALE

Quality Used Equipment

1—66" American Wheelabrator Swing Table shot blasting machine complete with Dust Collector and electric motors.
1—#602 Osborn Jolt Rollover and Pattern draw molding machine.
1—American Sandcutter, model "AM" with electric motors.
1—"Roots-Connersville" rotary positive pressure blower type BF. Size 16" x 54 in.
1—Steel plate chimney stack—48" dia. x 42' long.
1—Complete set of aluminum patterns for the production of Waterless Cast Aluminum Utensils.
1—Complete set of aluminum patterns for the production of 4" medium soil pipe fittings and a few building accessories in green sand.
1—Complete set of aluminum matchplates for the production of 4" medium soil pipe fittings with cores.

ST. JEROME INDUSTRIES LTD.
P.O. BOX 366
ST. JEROME (Terrebonne) P. Que.
CANADA

FOR SALE

OSBORN #J-332-48 Jolt Roll-Over-Squeeze Pattern Draw Molding Machine. Flask Size max. 26 x 36 x 13. Wonderful buy—used only a few months.

OSCILLATING PAN-TYPE CONVEYOR (Hewitt-Robins) 24" x 70'. Used less than two years. Reasonable.

SIMPSON #1½ Intensive Muller w/Aerator—splendid condition. Reasonable.

SIMPLICITY SHAKEOUT (heavy duty) 6' x 8' w/25 h.p. motor, extra deck. Reasonable.

MOULDERS' FRIEND 50" Brush rebuilt, w/extra brush.

For this and other good equipment

W. O. McMAHON
BOX 5799, HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
Phones TRemont 1-2088 and 9-6170

EQUIPMENT FOR SALE

2—Model M B&P Screenerators—both with new screens in excellent condition. $350.00 ea.
1—Bury Air Compressor—#H.L. 4818, 10 x 8 with 40 h.p. General Electric Motor $700.00
1—Five H.P. Grinder with dust collector $350.00
1—Champion Core Blower—size CB-10 No. 6668. Used very little $450.00
2—Hydroblast Tumbling barrels complete with two enclosed 15 h.p. motors. Both pumps recently overhauled with plenty spare parts ..... $500.00 ea.

CAPITAL BRASS & ALUMINUM FOUNDRY CO.
2706 NORTH CAMPBELL AVE.
CHICAGO 47, ILLINOIS

• FOR SALE

FOR SALE

Newaygo "Redi-mandy" Mod. RS-VM, complete
Skip Hoist for 27" x 36" American Wheelabrator Tumblast
Tabor cut-off machine, 5 h.p., 14" wheel
Eclipse Reverberatory Furnace Model F2000G
Skip Hoist for No. 9½ Cupola
Mold Conveyor 268' long
Osborn #405 Rollover
Vibrating Screens
International Rollover RES, Size 15"—6"
Milwaukee 163 Jolt Stripper
Champion JSL 12 Pin Lift, Jolt
Osborn 710J, Pin Lift
Osborn 212J, Jolt Squeezers
Osborn 275J, Jolt Squeezers
SPO 113 Jolt Squeezer
International LSJ, Jolt Squeezer
International PJS, Jolt Squeezer
Milwaukee 104 Jolt Squeezers
Champion JS 108 Jolt Squeezer
Arcade 1008 Jolt Squeezer
SPO 506 Jolt Rollover, Pin Lift, Draw
SPO 110 Jolt Squeezer
International Rollover 24-10 G, Portable
International Rollover 30 x 8, no jolt
International Rollover 30 x 12 G.
J & J 610 Rollover, portable
International Pin Lifts
Davenport Pin Lifts
Osborn 559 Pin Lifts
International Type R core rollover, hand
Swing Grinders
Royer Sand Preparators
B & P Preparators
Blystone Sand Mixers
American Sand Cutters, Models M, AM, AA
Core Ovens
Grinders, ½ hp to 25 hp
Disc Grinders
Ladles from 50-5,000 lb.
Pouring Devices, 500 lb. to 2000 lb.
Gyratory Riddles
Tramrail & Switches
Air Hoists, 1000 lb. to 10,000 lb.
Overhead chain conveyor #458, track, drives
Blowers—Centrifugal—positive—exhaust
17", 20", 28", 36" Stack Fans
Spencer Turbo Compressor, 3600 CFM @ 24 oz., 40 Hp. Motor
AAF Dust Collector, Type N. Size 1½, Wet
AAF Dust Collector, No. 40 Air Mat Dust Arrestor
Spencer Centrifugal Dust Collector, Multiple Vacuum Type, 300 CFM @ 5" of Hg., Vacuum
Turner & Hawes Dust Collector, Atmospheric Dry Filter Non-Automatic Type, Size 2500
Pangborn Dust Collector, Cloth & Screen Type Size 11,000 CFM

FLASKS
ALUMINUM
SLIP AND POP
SIZES FROM 10" x 10" TO 48" x 48"
JACKETS
ALUMINUM AND IRON
STEEL FLASKS
CORE PLATES
TRANSITE—IRON
MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE

THE HOMAN MACHINERY CO.
1144 HARRISON AVE. MAIN 1-0339
CINCINNATI 14, OHIO

• FOR SALE

FOR SALE

ELECTRIC MELTING FURNACES
Single Phase
1—DETROIT "LFA" 350# shell 13200V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300V.
30 KW Lepel
FLASK HOIST—ROLLER CONVEYOR
NATIONAL 24"; 8" long table
FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000V, 3 phase
PENNSYLVANIA 750 KVA, 13200 V., single phase.
1—WESTINGHOUSE 500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase.
FURNACES NONFERROUS
CAMPBELL HAUSFELD Staty., pot type
1—HEVI-DUTY HD-181-S Pot type, electric
2—400# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
1—CAMPBELL HAUSFELD Oil Fired 625# brass hand tilt
1000# STROMAN DC double dipout w/complete controls

ACME EQUIPMENT CO., INC.
126 SOUTH CLINTON STREET
CHICAGO 6, ILLINOIS

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVENUE
DAYTON 3, OHIO

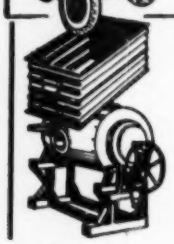
AJAX 30KW INDUCTION FURNACE

Air cooled M.G. set, 1.0 power factor, 3600 R.P.M., 400 volts, 4200 cycles, driven by 50 HP, 220/440 3 phase, 60 cycle induction motor. Serial No. P19855. Also includes manual reduced voltage motor starter 50 HP, 220 volts. One year old and in excellent condition.

NATIONAL METAL & FOUNDRY PRODUCTS CORP.
21-24 44th Avenue
LONG ISLAND CITY 1, N. Y.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — **CLEVELAND 10, OHIO**



WHEELABRATORS
1—20" x 27", 2 cu. ft. Tumblast
1—42" x 48", 17½ cu. ft. Tumblast with loader
1—66" Swingout table
1—4' Tablast w/six aux. tables
1—6' Table Airblast w/six aux. tables

WANTED!
COMPLETE FOUNDRIES, SMALL/LARGE.
PROMPT SERVICE.

MOLDING MACHINES (Automatic)
2—TDA4 Taccones

CORE OVEN
1—Di-Electric, Model CD-25
Coleman, 30 KW.

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACE
1—350 lbs. Detroit Rocking

— **GLENVILLE 1-1222**

Circle 871 on page 53

• FOR SALE

BEST BELT BUYS

Heavy duty, unused, 2500-3000 # cover tensile, 16-19 # friction pull, 3 weeks delivery.

4 ply 28 oz. duck:	LIST	SELL
14" — 1/8" x 1/32"	$4.31	$2.42
16" — 1/8" x 1/32"	4.86	2.72
18" — 1/8" x 1/32"	5.40	3.02
18" — 1/8" x 1/16"	5.69	3.19
20" — 1/8" x 1/32"	5.90	3.32
24" — 1/8" x 1/32"	6.95	3.90
24" — 1/8" x 1/16" (5 ply)	8.54	4.78
4 ply 32 oz. duck:		
24" — 1/8" x 1/16"	7.79	4.36
30" — 1/8" x 1/16"	9.58	5.36

Many other sizes. Samples on request. Distributor Inquiries invited.

PALTECH CO.
NEW CANAAN, CONN.
WO 6-4073

FOR SALE

COLEMAN DIELECTRIC CORE OVEN.
MODEL CD25.

Used very little. Will sell for less than half of original cost.

THE DEMING COMPANY
SALEM, OHIO

FOR SALE

Two Lindberg radiant fired electric furnaces complete with controls 440 V, 50 KW. Address: ALUMINUM MATCH PLATE CORP., 1500 MILITARY ROAD, BUFFALO 17, NEW YORK.

FOR SALE

27" x 36" American Wheelabrator with dust collector. Excellent condition. WELDON STUMP, 4835 CRESTRIDGE, TOLEDO 13, OHIO. Phone TUrner 2-2006.

• FOR SALE

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	4500.00
4' LF—Pangborn Table	2500.00
Pangborn 7 GK Barrel	1500.00
Rumelin 8 x 8 Room	1200.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
14 LG5 Pangborn Multi-table 5—5' tables	9000.00
48 x 48 Wheelabrator Tum. w/loader	3500.00
42 x 48 Wheelabrator Tum. w/loader	2750.00
Skiphoist—For all Wheelabrator Tumblast	
8' Wheelabrator Table Blast	2000.00
6' Wheelabrator Table Room	4800.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-3-6750

FOR SALE
MOTOR—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51—Rochester 1, New York

• FOR SALE

FOR SALE

1—Simpson #0 Muller—Style M (never used)
1—Simpson 18" Muller
1—Lancaster Mixer, Model EBG-4
1—Lancaster Mixer, Model EAG-3
1—Ingersoll Rand Air Compressor, Type PRE-2, 24" x 16", 100# pressure with 300 HP Motor.
3—Link Belt Roto-Louver Rotary Dryers, Models, 207-10, 310-16, and 604-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R. R.
UNION, NEW JERSEY

FOR SALE

1—Jolt Squeeze Rollover Molding Machine, International, 30" x 50" table.
1—No. 2 Intensive Foundry Muller, Simpson Style, 6' dia.

B & H MACHINE WORKS
1027—41st AVE.
OAKLAND 1, CALIF.

FOR SALE

CORE BLOWERS, rebuilt and guaranteed
2—Demmler model #55
1—Taccone bench type, horizontal or vertical clamping.

BOX 804, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FURNACE

400 GE Reda—Very good to excellent condition. Located in Texas—will deliver to El Paso, Tucson, Bakersfield, Fresno, Bay area, San Francisco. Western Metals Division, 2001 Auburn, Lubbock, Texas, Phone PO 5-8877.

HN

"Foundry Equipment by foundry.men"

INTRODUCING
a trademark to remember . . .
a name to trust . . . .
HAMLIN-NAGEL, INC.
Box 192 Edwardsville, Ill. Phone 3864
In metropolitan St. Louis

1956 B & P MOTIVE JR. SANDSLINGER, COMPLETE WITH 3 TANKS & RAILS COMPLETE WITH ALL AVAILABLE FEATURES

JOLT SQUEEZERS
International PJS-16" cyl.
International L-JS10
Osborn 275J
SPO 110J
Tabor Top Squeezers
JOLT SQUEEZE ROLLOVER DRAW
SPO 920
JOLT ROLLOVER DRAW
International F
SPO 506
International Type "G" 30 x 12
Tabor 30 x 50
Herman 40 x 60—1000 #

JOLT PIN LIFT
Davenport 34-A
J & J 68-S
Osborn 559
Milwaukee 1536
JOLT SQUEEZE PIN LIFT
Milwaukee 126
MULLERS
B & P 60 + Multromatic
Simpson No. 2 Skip Hoist + Aerator
CORE BLOWERS
Demmler 103EO with Skip and Feeder, Automatic Cycle
Demmler No. 1 & No. 2

Redford No. 1 & No. 2
Champion CB-11
MODEL M & L SCREENARATORS
HANDY SANDY'S
AIR COMPRESSORS,
10, 15, 40 hp, water cooled.
FORKLIFT TRUCKS
FOXBORO AIR WEIGHT CONTROLLERS
GRINDERS, 18" & 24"
HOISTS, air and electric
POURING DEVICES
DETROIT HARDNESS TESTERS
FLASKS, Steel 20 x 40, 24 x 30 and 22 x 44

FLASKS, aluminum slip
JACKETS
ALUMINUM & WOPPER JAW
CORE PLATES, Aluminum & Transite
HOUGH HA PAYLOADERS
1 YARD CLAMSHELL BUCKET
HOLLINGSWORTH 44 x 48 WHEELABRATOR
#3½ CUPOLA FORKLIFT CASTING BOXES
PATTERN SHOP EQUIPMENT:
Disc Sanders, Double Arbor Table Saw, Lathe, Jointer, Roovers Embosser

FOUNDRY ENGINEERING SERVICE
WANTED! GOOD SURPLUS EQUIPMENT

HN HN HN HN

Circle 872 on Page 53

THE ACME BARGAIN PAGE

AERATOR
NEWAYGO

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

BLOWERS
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm., 24 oz., 55 hp. motor
SPENCER 7350 cfm., 16 oz., 50 hp.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
Ingersoll-Rand 12900 cfm, 100 h.p. 220-440V, 20 oz.
McKee 200 cfm
North American 850 cfm.
NORTH AMERICAN 1050 cfm., 16 oz.

BUFFERS
6—HAMMOND VROL 3 hp variable speed
HAMMOND 5-VRO 5 hp variable speed
STANDARD 20 RSB 20 h.p.
MARSCHKE Roto-Mat 6 Station

CLEANING EQUIPMENT
Model 4836V-B VAPOR BLAST
VACU-BLAST C9-D5

CONVEYOR OVERHEAD CHAIN
1400' JERVIS B. WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, take-ups and turns.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.

CORE BLOWERS
CHAMPION CB15 55# cores
CHAMPION CB10 12# cores
DEMMLER #2, 20# cores
DEMMLER #2K, 20# cores
REDFORD Bench types, horizontal or vertical clamping
CB15 55# cores, Universal blow plate
DEMMLER #4 up to 250# cores
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
5—DESPATCH, Gas Fired, 3 Drawer

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw

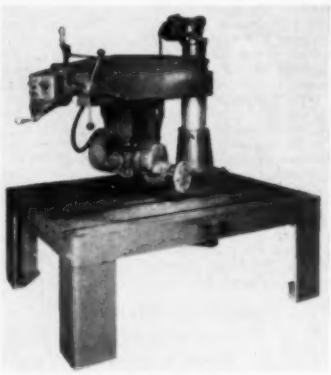
CRANES
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—BONDACTOR #1250
BONDACTOR #1000

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
ROTOCLONE, Size 6, Wet Type, 3000 cfm
ROTOCLONE N-15 h.p. 6600 cfm
ROTOCLONE W14 Arrang. A, 5200 cfm.

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ hp.

GRINDERS, MISC.
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel
GARDNER 18" single end disc.
HANCHETT 30" double spindle opposed
GARDNER 26" D.E. Disc.
GARDNER 30" D.E. Disc.



10—DEWALT CUTOFF SAWS for ferrous or nonferrous metals, cutoff or as sprue cutters. Flush blade adaptor takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting of large work. Motor swivels horizontal to vertical in yoke.

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
LINDBERG 48" x 48" x 72" Elec., 1250°, box type.

HOISTS
10 ton SHAW BOX electric hoist
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL-RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

INDUCTION MELTING EQUIPMENT
100 KW-Ajax 300# 3000 cycle, 150 h.p. 4 bearings M8 set, water cooled, complete controls
30 KW Lepel Spark Gap
35 KW Ajax Tama Wyatt, 60 cycle induction holding furnaces
1000# Ajax Spare Melting Furnaces—Unused

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
2—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
2—#2114G SPO table, 20" x 27"-11" cyl.

SPECIAL! FACTORY REBUILDING
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw. Flask size 25½" to 29" wide, 52" long. New 1951. WILL BE FACTORY REBUILT.

JOLT SQUEEZERS
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
2—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table

JOLT ROLLOVER DRAWS
HERMAN 10000# late
HERMAN 3000#
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
3—SPO 9032

JOLT SQUEEZE ROLLOVER DRAW
2—#331 OSBORN 24" x 30" flask area, 7" draw

JOLT PIN LIFTS
2—INTERNATIONAL 1200-S 26" x 27" table, 8" draw

PLAIN JOLT
40" x 84" Herman
36" x 60" Herman

MULLERS and MIXERS
2—#3 UD Simpson
1—930 Clearfield
1—#1 Simpson Muller

B & P #30 w/skip multrol, also has cooling or heating coils for plastic or shell.

SAND CUTTERS
AMERICAN 51"
JEFFREY SANDITIONER

SAND SLINGERS
1—B&P Tractor, 19" heads
B & P Stationary 16" single speed
B & P Stationary 19", 5" tip 2 speed

SAND SYSTEMS
2—NEWAYGO SUPER HANDY SANDY; like new

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
42" TANNEWITZ, 5 hp., 220-440 V.

SHAKEOUTS
3' x 5' ROBBINS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
4' x 10' SIMPLICITY
3' x 10' SIMPLICITY

SHELL EQUIPMENT
SHELL PRODUCTS 20" x 30" pattern size w/shell blender and bonding press

SHOT BLAST
SLY #4, 20" x 30" w/dust collector

SPRUE CUTTERS
1—MILWAUKEE #85 TON

STRAIGHTENING PRESS HYDRAULIC
150 ton HPM
150 ton Farquhar "C" Frame
100 ton Watson Stillman "C" Frame
60 ton Lempco 4 post
60 ton Farquhar "C" Frame

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
TYLER ROTAP Testing Sieve w/screens
TINIUS OLSON Brinnel Hardness Tester Production
TINIUS OLSON Brinnel Hardness Tester Bench

TUMBLING BARRELS
1—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY, 24" x 42"; 3 H.P.

WHEELABRATORS
27" x 36" American w/skip
48" x 48" American Gun type Cabinet
2—20" x 27" AMERICAN, w/rubber belt
AMERICAN #1A Tablast, S/N 64850
1—42" x 48" AMERICAN Skip Loader.
AMERICAN #2 Tablast 8-28" tables, late
3—HOLLINGSWORTH 44" x 48" Wheelabrators

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
HERMANCE 24" Planer
JONES SUPERIOR 48" Double Disc
BOICE CRANE 12" Planer
OLIVER #290 DSI Arbor, Tilt-Arbor Saw
1—OLIVER 182D, 15" Disc Sanders
WALLACE 8" Jointer
CRESCENT 24" Planer
TANNEWITZ 42" Band Saw
ONSRUD W-244 & W-240 Routers
8", 12" and 30" Jointers
16", 32", 36" Band Saws

WIRE STRAIGHTENERS
1—#2A Climax ¼"
B-21-Multiplex Wire Bender & Cutter

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AIR COMPRESSORS
1—75 hp INGERSOLL-RAND water cooled, horizontal
1—100 hp WORTHINGTON air cooled, 2 stage

AIR HOISTS
14—INGERSOLL-RAND ½ ton, 1 ton, and 2 ton.

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent. Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—15" Continuous WHEELABRATOR
1—26" Continuous WHEELABRATOR
1—15" x 20" WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
2—27" x 36" WHEELABRATOR Tumblast, one rubber belt, one steel conveyor
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast,
1—24" WHEELABRATOR Swing Table
1—1-A WHEELABRATOR Multi-table with 6—26" aux. tables, 10—16" aux. tables
1—PANGBORN TABLAST, 8' Table, 2500 #
1—PANGBORN 8'LK Table Room
1—PANGBORN Room Type 23 "MS," 5' x 2[illegible]' table
1—8L[illegible] 60" x 42" Round
4—8L[illegible] 48" x 36" Round

CONVEYORS
1—HEWITT-ROBINS Oscillating, 18" W x 40' L
1—HEWITT-ROBBINS Vibrating, 18" W x 10' L. Model VC-I
1—LINK-BELT Bucket Elevator, 8" x 12" buckets on 14" rubber belt, completely enclosed by 2' x 4' casing.
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10' Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS
1—CHAMPION CB-5
10—DEMMLER #1, #2, #2A, #3, #4E
3—INTERNATIONAL 8B-13
3—OSBORN #91, #192, #91-10
1—RANDALL Model "A," Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
1—WHITING #3½
1—WHITING #6

DUST COLLECTORS
COMPLETE STOCK—both Wet & Bag Type —send us your requirements

FURNACES—DIRECT ARC MELTING
1—250 lb. LECTROMELT, Bldv Charge
1—500 lb. LECTROMELT, 200 KVA trans.
1—1000 lb. SWINDELL
1—2000 lb. HEROULT
1—2000 lb. SWINDELL, 3/60 1000 KVA.
1—1½ Ton HEROULT
1—3 Ton LECTROMELT, Door Charge
1—3 Ton SWINDELL, Hyd. Top Charge.
1—15 ton SWINDELL—3000 KVA Transformer. Latest type.

FURNACES—INDIRECT ARC
1—10 # DETROIT
1—60 # DETROIT
1—350 # DETROIT LFA
1—750 # DETROIT LPY, Conical Shell,
1—1000 # DETROIT AAD P, 300 KVA
1—3000 # Detroit C, 500 KVA

BEST WISHES
for a
HAPPY HOLIDAY
and a
PROSPEROUS
NEW YEAR

FURNACES—INDUCTION MELTING
1—35 KVA AJAX 60 cy., alum.
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—1250 KW 2 Ton Cap.

FURNACES—GAS & OIL
1—400 # FISHER MNP, Gas Fired, Alum.
1—1 #900 JC STROMAN, gas. Like new
1—1200 # Brass, MNP, Oil

FURNACES—HEAT TREAT
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—20" x 36" L&N Draw electric
1—10" x 24" x 60" Gas, double end doors
1—12" x 36" x 8" high HAYES "Certain Curtain"
1—7' Rotary G.E., 200 KW, 1950° F
1—36" x 36" WESTINGHOUSE Pit Type.

MOLDING MACHINES
Jolt Rollover Pattern Draw
1—HERMAN 10,000 #, 48" x 109" table
1—HERMAN 6000 #, 42" x 78"
2—HERMAN 7500 #, 40" x 50" tables
1—HERMAN 7500 #, 40" x 60" table
1—HERMAN 3000 #, 30" x 66" table
5—HERMAN 1500 # to 30" x 48" tables
3—HERMAN 750 #, 24" x 30" tables
1—INTERNATIONAL 30" x 12", Type G, [illegible]" x 35" table
2—[illegible]NATIONAL 13" x 17" tables
1—J & J #5RB, 30" x 40", table 1200 #
1—OSBORN #442, 21" x 31" table, 600 #
1—OSBORN #602, 36" x 26", 900 #
1—OSBORN #405, 3000 #, flask size 64" x 37", 26" draw
1—SPO #506, 24" x 25" table, 600 #
4—TABOR 40" x 60", 1500 & 3000 # capacity
2—TABOR 30" x 40" w/air clamps, 1000 #
1—TABOR 22" x 42", pattern draw, shockless, portable, 600 #
1—TABOR 20" x 30", w/air clamps, 1000 #
2—TABOR 14" x 16" Rockover 150 #
1—TABOR 40" x 50" table, 3000 # capacity

Plain Jolt
2—DAVENPORT, table 24" x 27", 1200 #
1—INTERNATIONAL, 3' x 4' table, 12" cylinder

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
2—INTERNATIONAL JDP, 1200 x 8", 24" x 26" table, 8" draw, 1200 #, port.
1—J & J #651-C, 30" x 25" table, 600 #
1—OSBORN #559, 25" x 30" table, 6" draw, 1200 #
2—SPO #306, 750 lb., 20" x 27" table
1—TABOR 20" x 24" table, 600 #

Jolt Squeeze Pin Lift
2—INTERNATIONAL PKL, 20" x 28" table, 14" sq., 5½" draw
2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200 #, 8" draw
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500 #
1—MILWAUKEE #165, 24" x 30" table, 16" squeeze, 1700 #
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
5—SPO #2114P, 21" x 27" table, 600 #
2—SPO #2116, 21" x 27" table, 11" sq., 6" draw

Jolt Squeezers
2—INTERNATIONAL #12 LJS, 16" x 20" table
4—INTERNATIONAL #10 LJS, 16" x 20"
1—NICHOLS #12 F-P, portable, 600 #
2—OSBORN #276J, 17" x 26" table, 13" squeeze, 500 # port.
10—OSBORN #275J, 16" x 20" table, 400 # port.
12—SPO #110J, 17" x 20" table port.
1—SPO #113 J, 18½" x 26" table, 13" cyl. port.
3—TABOR Squeeze-in Head, 16" x 19" table

MATERIALS HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000 # cap., hyd. lift, mech. dump

MULLERS AND MIXERS
1—B&P #30 Speedmuller w/skip hoist, 3 cu. ft. batch
1—B&P #40 Speedmuller w/skip hoist, 5 cu. ft. batch
1—B&P #7 Mulbaro, 7 cu. ft. capacity
1—B&P #60 Speedmuller, 10 cu. ft. batch
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—CLEARFIELD #404, 4' Dia, 4 cu ft batch
1—CLEARFIELD #610, 6' Dia., 10-14 cu. ft. batch
1—SIMPSON #0, U.D., 3' Dia, never used
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft. batch
1—SIMPSON #2, 6' U.D. Dia, 14 cu ft batch
2—SIMPSON #3, enc. gear, 20-25 cu. ft. batch
1—SIMPSON #3, 5' Dia. Open Gear, 20-25 cu ft batch
1—SIMPSON #1½, U.D., 6 cu. ft. batch

LADLES
Bottom Pour
4—MODERN, 49" x 49"
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top

Holding
1—MODERN 80"L x 45" dia. geared

Lip Pour
1—WHITING 40" x 40" top dia. geared

Cylindrical
8—WHITING, 26" L x 25" dia., 1100 # iron
7—WHITING, 19" L x 22" dia., 600 # iron
3—WHITING, 38" L x 28" dia., 2200 # iron

OVENS
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
1—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
1—GENRICH Electric, Rack Type, 5' W x 7' H x 5'3" L
3—GENRICH, Elec. elevator type, Inspection under operation in N.Y.C.—Excellent Condition

SAND CONDITIONING
1—AMERICAN Sand Cutter, Model AA, 62" cutting reel
1—B & P Nite-Gang
2—B & P Screenarator, Model "S" & "M"
1—LINK-BELT Revivifier
1—MOULDER'S FRIEND, 50" cutting reel
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp
1—SIMPLICITY Type SOBG, 4' x 5' screen

SAND SLINGERS
1—B&P Stationary, Single Speed
2—B&P Tractor Type, 16" head
2—B&P Tractor Type, 19" head

TESTING EQUIPMENT
1—500,000 lb. TINIUS OLSEN Hydraulic Compression Testing Machine
BRINNEL Hardness Testers, Manual & Motorized
1—10,000 # BALDWIN-UNIVERSAL

MISCELLANEOUS
1—200 KW, 230 volt D.C. MG Set
1—BONDACTOR Cupola Gun
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
FLASKS, CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener
10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP

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AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes A, B, C, D, D-6 & E, ½, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5ton cap.
1—DETROIT Model LHR, 5 ton, elec.
20—THOR air hoists, ½, 1 & 2 ton cap.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40, 50, 60 ft. ce, 10 x 7, 12 x 7, 14 x 7, 16 x 8 buckets.

CUT-OFF MACHINES

1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-15, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER #50 Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E. 10 to 160 lb.
1—FEDERAL 40P-1 San-Blo.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. Cores.
2—REDFORD #2—Magazine type.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
2—PORBECK Batch type 10' L x 8' W.
1—DESPATCH Type "B" 6' w x 16½' l x 7½' h Oil Fired.
1—FOUNDRY EQUIP. 3 comp. 6' x 7' x 12' ea. Gas or oil.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP. 3500 to 10,500 CFM w/blast gates.
1—CUPOLA Bondactor, style 1205-L.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

4—DETROIT LFA, 350# Cold Charge 700# Molten w/200 KVA transformers.
1—TOCCO 20 KW induction, 9600 cycles.
3—AJAX No 100 & 300 Furnaces Only.
6—AJAX 35 KW Induction 460 V 1 phase.
1—DETROIT Size CM—4000# Charge, 8000# Molten, w/1000 KVA trans.
2—AJAX 20 KW Hi Frequency Converters.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary. Sizes 100, 150, 200 & 550 cap.
1—LINDBERG #400 BBI hand tilt.
1—SKLEENAR 1200# Rev., hand tilt.
1—MONARCH 600# Rev., hand tilt.
1—STROMAN, "U" 600# Reverb.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

GRINDERS

Swing Frame

1—FOX #4 Wheel 24" x 3"—20 HP
1—MARSCHKE 20" x 10" wheel, 10 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

4—FOX #7—30" x 3" Wheel, 15 HP.
2—U. S. #64, 20" x 3", 7½ HP. 4 speed.
2—SAFETY #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 15 HP, 4 Speed.
U. S. No. 62VB, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 2450, & 3000 lbs. capacity, All Enclosed Gears.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

MOLDING MACHINES

Jolt Squeezers

12—OSBORN No. 275-J—17x20 Table, 10"
15—OSBORN No. 276-J—17x26 Table, 13"
2—OSBORN No. 216-PJ—21-32 Table, 16"
6—MILWAUKEE 123—17x26 Table, 12"
2—MILWAUKEE 181—24x36 Table, 18"
10—INT. PVJS—20x26 Table, 12" cyl.
9—SPO No. 110-J—17" x 20" Table, 10"
8—SPO No. 113-J—17" x 26" Table, 13"

Plain Jolt

1—J&J 50 x 72 Table—5000# cap.
2—OSBORN 60" x 72" table, 6000# cap.
1—TABOR 36" x 36" table, 1000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28A, 28" x 44" table.
1—DAVENPORT 28-8A, 29" x 40" table.
2—HERMAN 20" x 30"—750# series.
2—HERMAN 26" x 48"—1500# series.
2—HERMAN 50" x 60"—300# series.
2—HERMAN 40" x 48"—400# series.
1—HERMAN 60" x 84"—6000# series.
1—HERMAN 60" x 84"—10,000# series.
14—INTERNATIONAL TYPE G, Sizes 20" x 8", 24" x 10", and 30" x 8".
1—J & J #920 RC—44" x 54"—Hyd. head.
1—J & J #1020 RC—50" x 60"—Hyd. head.
2—J&J #612, 24" x 30" Table.
4—J&J #918, 44" x 54" Table.
1—J&J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO No. 9546—26" x 32" Table.
1—SPO No. 917-A—40" x 29" Table.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508, table size 28" x 30".
1—SPO 5050, Table 25" x 30", 10" draw
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift

2—DAVENPORT #34 AJS.
3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" Table.
2—INTERNATIONAL JDP 3000# x 10" Draw 48" x 48" table.
1—J & J #8125—30" x 38" Table—10" draw.
1—MILWAUKEE #2542.
2—J & J No. 688 25" x 30" table, 6" draw.
2—MILWAUKEE No. 1030—30x38 Table.
1—MILWAUKEE No. 1536 32x38 Table.
3—MILWAUKEE No. 3545—44x48 Table.
2—OSBORN #559, 25" x 30" table.
1—SPO #3058, 22" x 28" table, 8" draw
2—SPO #3070, Table 26" x 35", 10" draw

Pin Lift

2—B & P Model AL 2428 Speed Draw.
1—MILWAUKEE #620 ND Push
2—MILWAUKEE No. 195.
2—INTERNATIONAL #PK-16.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE No. 1065, 24" x 30" table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORN 714PJ, 20" x 31" Tables.
1—OSBORN #818—24x36 Table, 18" cyl.
1—MILWAUKEE #246—23¼x42 Table.
4—INTERNATIONAL PKL, 17" x 26".
1—SPO #2136-6.
2—SPO 2114P, Table 21" x 27", 11" cyl.
2—SPO 2160-R, Table 24" x 30", 16" cyl.

Shell Molding

1—SHALCO, Model HO4, 2 station.

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
2—18" W x 18' L x 4" deep pan
2—SIMPLICITY 24" W x 13' L x 6" Deep.
1—SIMPLICITY 18" W x 11' L x 6" Deep.
1—SIMPLICITY 24' w x 19' x 6".

Roller

2500' MATHEWS 6", 14" wide, 2⅞" dia. roller, 1¼" hex shaft, 4" channel.
1500—MATHEWS 8" wide, 3½" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—DUO-ROLL 88 Cars 20" x 48", 350' track, with automatic dumping.
1—PALMER "B" 106 Cars—42" x 62" w/550' Track.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

1—NATIONAL ENGINEERING "Moulders Helper" 2 Hopper Unit.
7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO H8-7-GT, Handy Handy.
42—MOLDERS Hoppers 1⅛ ton cap.

SAND MULLERS

3—B & P No. 80A Speed Muller—24 cu. ft. air cooled.
1—B&P #3½ Mulbaro, 3½ cu. ft.
1—B&P #30 Speedmullor, 4 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #50 Speedmullor, 9 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #60 Speedmullor, 12 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #70 Speedmullor, 18 cu. ft.
1—BESSER Paddle Type, 30 cu. ft.
1—CINCINNATI 24" muller.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu ft batch.
1—CLEARFIELD #404, 4 cu. ft. batch.
1—DRAVO-DOYLE 6 cu ft cap. Port.
1—LINK-BELT 48" x 8' Paddle Type.
2—MASTER 400# Shell Type pan dia.
1—PEKAY No. 160-1-24 M. Muller, single stage for 24" belt, [illegible] PH.
1—SIMPSON #1-H Style UD, 400# batch
2—SIMPSON #1½ style UD, 700# batch w/loader.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.

SAND PREPARATORS

6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" & 60" Brush.
2—NEWAYGO RS-V Reddy Sandys.
1—SIMPLICITY LP 2' x 3' screen.

SANDSLINGERS

1—B&P 5-ton capacity Plate Feeder
2—B & P Tractor Type 19" head & 16" head, 13' arms, Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
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4—B & P S ton plate feeders.
2—B & P 35 ton capacity plate feeders.
6—B & P Tanks for speed slingers.
1—B&P Motive 15' Jib—6' Ram—19".
1—B&P Motive Jr. 8' Jib—4' Ram—19".

SHAKEOUTS & SCREENS

2—LINK-BELT 5' x 10', 6 ton cap.
3—SIMPLICITY 4' x 6' Model B.
1—SIMPLICITY 4' x 8' Model D.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
1—ROBBINS 6' x 10' JF11—20,000#.

SAND BLAST EQUIPMENT

2—AMERICAN 36" continuous Tumblasts
1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48", w/skip hoist
1—AMERICAN 48" x 72" w/loader.
1—AMERICAN No. 2 Tablast—6' dia. Plain Table.
1—AMERICAN #3 Tablast, 4—48" tables.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN 6 LG-14 Multi-Table, 6-24" tables, w/dust collector.
1—PANGBORN Model 14GK-7 Roto-Blast barrel w/loader.
1—PANGBORN 9LG-14 Multi-Table w/6—36" dia. Aux. Tables w/Dust Collector.

AAA MACHINERY & EQUIPMENT CO.

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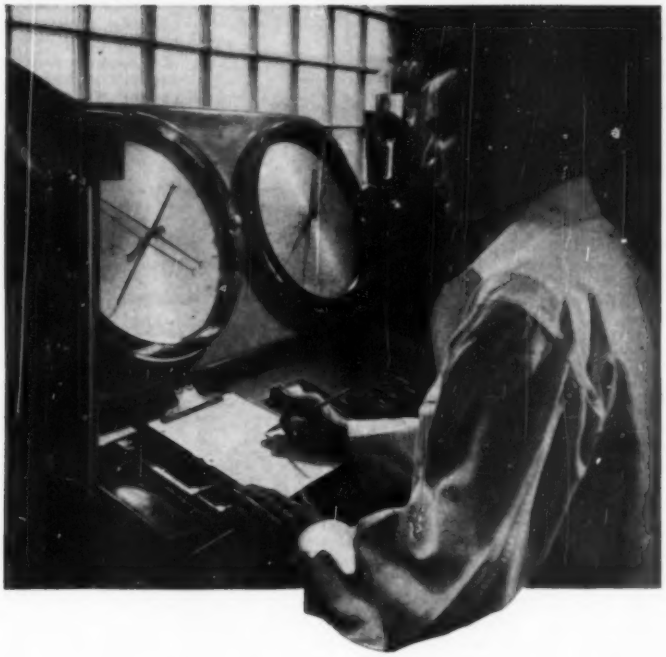

- **DESIGN**
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Today, thousands of Mechanical Engineering students are studying Foundry as an engineering process and cast metals as an engineering material at FEF schools.

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Foundry Educational Foundation

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Circle 696 on Page 53

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because it improves casting quality while cutting sand preparation costs. The Ringlift machine picks up all sand from floor, screens, aerates and tempers it, removes scrap magnetically, adds moisture and deposits sand on floors in neat windrows. Fast, easy to operate. Send for literature now.

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Circle 697 on Page 53

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Circle 698 on Page 53

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Originators of Fully Automated Sand Systems for Foundries

■■■ Full details will be sent promptly on complete systems •, Sand Controls •
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Circle 704 on Page 53

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THE DESIGN OF STEEL CASTINGS

This highly specialized book deals with steel castings design from the view point of soundness, economy in production and good engineering design.

It is an up-to-date study of the problems of steel castings design and is well illustrated by one hundred and twenty one working diagrams.

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Advertising Index

Abrasive Products, Inc., Atlantic Abrasive Corporation Division 112
Acme Foundry Co. 164
Acme Resin Corporation 186
Adams Co., The 8
Ajax Flexible Coupling Co., Inc. 170
Ajax Magnethermic Corporation 131
Allis-Chalmers 122
Alloy Metal Abrasive Co. 48, 49
Alloy Metal Products, Inc. 139
Aluminium Limited Sales, Inc. 45
American Air Filter Co., Inc. 20
American Bridge Division, United States Steel Corporation 9
American Chain Division, American Chain & Cable Co., Inc. 225
American-Marietta Co., Adhesive, Resin & Chemical Division 43
American Optical Co., Safety Products Division 28
Aquadyne Corporation 169
Arcair Co., The 190
Archer-Daniels-Midland Co., Federal Foundry Supply Division 5, 11
Atlantic Abrasive Corporation, A Division of Abrasive Products, Inc. 112

Bailey, William, M., Co. 12
Baroid Chemicals, Inc., A Subsidiary of National Lead Co. 21
Basic Products Corporation, Hevi-Duty Division 92
Bay State Abrasive Products Co. 14, 15
Beardsley & Piper Co. 159, 160, 161, 162
Becker Brothers Carbon Co. 211
Bellows Co., The, Division of International Basic Economy Corporation 32
Berkshire Chemicals, Inc. 156
British Moulding Machine Co., Ltd. 197
Budd Co., The, Nuclear Systems Division ... 185
Burr Aluminum Products 212

Carman, Edwin S., Inc. 210
Carver Foundry Products Co. 16, 17
Cedar Heights Clay Co. 173
Cement Gun Co. 184
Centrifugal Casting Machine Co. 212
Chicago Pneumatic Tool Co. 50
Cities Service Oil Co. 101
Clearfield Machine Co. 189
Cleco Air Tools, Division of Reed Roller Bit Co. 147
Cleveland Flux Co., The 132
Cleveland Metal Abrasive Co., The 207
Cleveland Tramrail Division, The Cleveland Crane & Engineering Co. 44
Crucible Manufacturing Association 187

DeBardeleben Coal Corporation 210
Demmler Manufacturing Co. 179
Dependable Shell Core Machines, Inc. 204
Desmond-Stephan Mfg. Co. 169
Detroit Electric Furnace Division, of Kuhlman Electric Co. 22
Diamond Alkali Co. 210
Dietert, Harry, W. Co. 135
DuPont, E. I., De Nemours & Co., Inc. 30
Durez Plastics Division, Hooker Chemical Corporation 142, 143

Euclid Crane & Hoist Co., The 222

Fanner Manufacturing Co., The 26
F. E. (North America) Ltd. 95
Foundry Design Co. 167
Foundry Educational Foundation 221
Foundry Equipment Co., The 18
Foundry Services, Inc. 124, 156, 169

Gardner-Denver Co. 42
General Mills, Mechanical Division 124
Globe Steel Abrasive Co., The 193
Goodrich, B. F., Chemical Co. 13
Great Western Mfg. Co. 212

Hanna Furnace Corporation, The 120, 121
Hartley Controls Corporation 222
Herman Pneumatic Machine Co. 56, 57
Hevi-Duty, A Division of Basic Products Corporation 92
Hines Flask Co., The 127
Hooker Chemical Corporation, Durez Plastics Division 142, 143
Hough, Frank G., Co., The 27

Industrial Equipment Co. 191
Ingersoll-Rand Co. 40
International Automation Corporation 155
International Basic Economy Corporation, The Bellows Co., Division 32
International Nickel Co., Inc., The 1
Ironton Fire Brick Co., The 123

Jeffrey Manufacturing Co., The 24
Johns-Manville 23, 96
Joy Manufacturing Co. 117, 119

Kaiser Aluminum & Chemical Sales, Inc. 55
Keokuk Electro-Metals Co. 168
Kirk & Blum Manufacturing Co., The 180

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FOUNDRY is edited primarily for management, production, technical and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve key foundry personnel on an individual or routed basis. A limited number of copies is supplied at no cost to educational institutions.
Subscriptions in the U. S., possessions, and Canada for name-addressed copies and copies not qualified under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2.

FOUNDRY is indexed regularly by
Engineering Index Inc.
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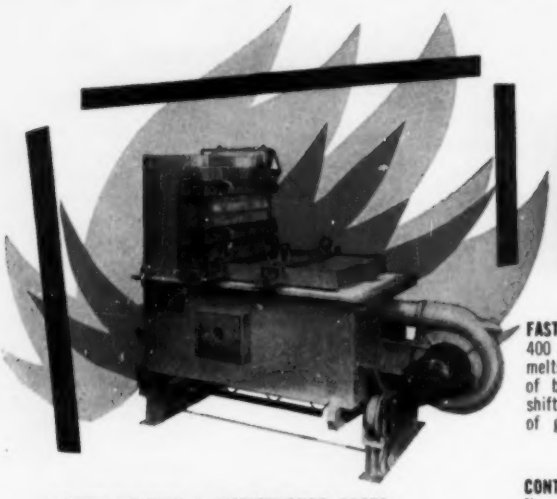
USING REDA GAS-OIL FIRED FURNACES!



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FASTER MELTING — One 400 series Reda Furnace melts up to 11,000 lbs. of brass or bronze per shift, and up to 6,000 lbs. of gray iron per shift.

LOWER MELTING & MAINTENANCE COSTS — One man can operate a Reda Furnace . . . No daily repairs needed!

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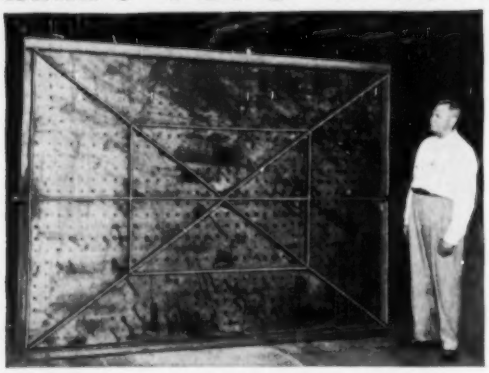
FURNACE DIVISION WRITE TODAY FOR DESCRIPTIVE BULLETIN
REDA PUMP COMPANY - BARTLESVILLE, OKLAHOMA

Circle 701 on Page 53

HERE'S "TOPS" in BOTTOM BOARDS



Mighty BIG is this Sterling-made Bottom Board, and mighty well engineered . . . as all Sterling Core Plates and Bottom Boards are . . . to prevent warping or twisting. All welded steel heavy reinforcing angles and bars assure maximum strength and rigidity. This big bottom board suggests the versatility of Sterling foundry equipment engineers. Another reason why Sterling is "TOPS" in this field.

STERLING MAKES THEM THE WAY YOU NEED THEM

Standard Core Plate and Bottom Board Styles are available in various sizes. Special designs, including round bottom boards, can be made to meet your needs. *Write for Catalog.*

STERLING NATIONAL INDUSTRIES, Inc., Milwaukee 14, Wis., U. S. A.
Founded 1904 as Sterling Wheelbarrow Company

Sterling FOUNDRY EQUIPMENT

A-8143-½R

Circle 639 on Page 53

Advertising Index

Knight, Lester, B., & Associates, Inc. 201
Koch, George, Sons, Inc. 140
Koppers Co., Inc. 203
Kuhlman Electric Co., Detroit Electric Furnace Division 22

Lectromelt Furnace Division, McGraw-Edison Co. 51
Lindberg Engineering Co., Lindberg-Fisher Division 41
Lindberg-Fisher Division, Lindberg Engineering Co. 41
Link-Belt Co. 31

McGraw-Edison Co., Lectromelt Furnace Division 51

Magnet Cove Barium Corporation, The ..... Inside Front Cover
Mathews Conveyer Co. 150
Mayer, Carl, Corporation, The 102
Metal Blast Inc. 145
Milwaukee Chaplet & Mfg. Co. 175
Minnesota Mining & Manufacturing Co. 165
Modern Equipment Co. 226
Murphy, James, A., & Co., Inc. 222

National Acme Co. 98, 99
National Carbon Co., Division of Union Carbide Corporation 183
National Engineering Co. ..107, 108, 109, 110
National Metal Abrasive Co. 205
Newaygo Engineering Co. 115
North American Refractories Co. 200
Norton Co. 52, 181

Ohio Ferro-Alloys Corporation 129
Oliver Machinery Co. 211
Osborn Manufacturing Co., The 104, 105

Pangborn Corporation 176, 177
Penn Iron Works, Inc. 211
Philadelphia Quartz Co. 193
Pickands Mather & Co. 157
Pittsburgh Coke & Chemicals Co. 149

Reda Pump Co., Furnace Division 224
Redford Iron & Equipment Co. 151
Reed Roller Bit Co., Cleco Air Tools Division 147
Reichhold Chemicals, Inc., The .... Back Cover
Republic Steel Corporation 38, 39

Advertising Index

Royce Iron Works, Inc. 191
Royer Foundry & Machine Co. 125

Scientific Cast Products Corporation, The 211
Security Alloys Co., Inc. 192
Simplicity Engineering Co. 46
Smith, G. E., Inc. 209
Smith Oil & Refining Co. 137
Spencer Turbine Co., The 130
Spincraft, Inc. 113
Spraying Systems, Co. 210
Standard Conveyor Co. 134
States Engineering Corporation 222
Sterling National Industries, Inc. 58, 224
Stevens, Frederic B., The .. Inside Back Cover
Sutter Products Co. 6, 7

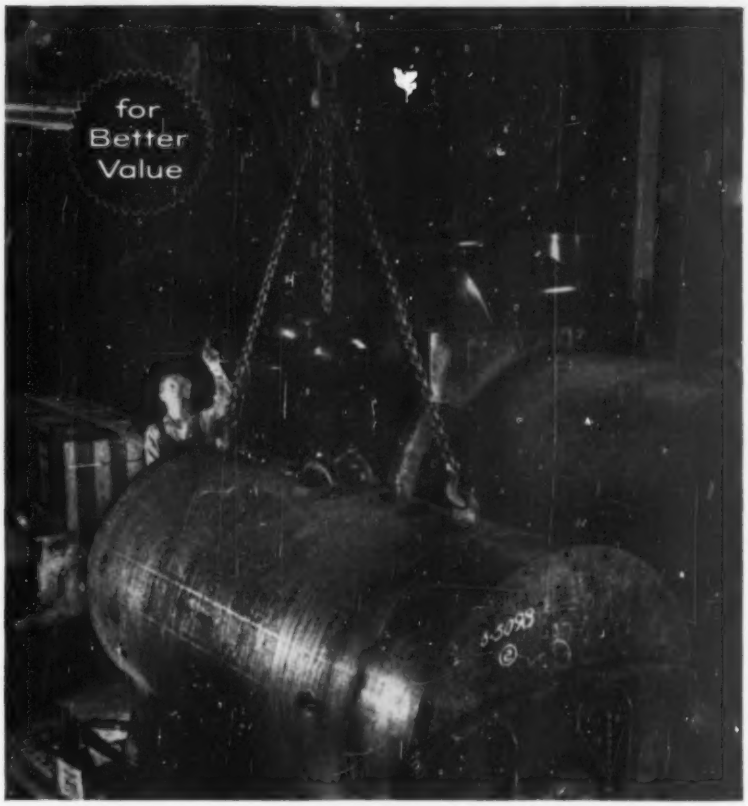
Tabor Manufacturing Co., Division of Turbo Machine Co. 19
Tannewitz Works, Inc., The 184
Thiem Products, Inc. 29
Tomkins-Johnson Co., The 171
Turbo Machine Co., Tabor Manufacturing Co. Division 19

Union Carbide Corporation, National Carbon Co., Division 183
Union Carbide Metals Co., Division of Union Carbide Corporation 25
United States Electrical Tool Co., The 10
United States Graphite Co., The, Division of The Wickes Corporation 141
United States Rubber, Mechanical Goods Division 91
United States Steel Corporation, American Bridge Division 9
United States Steel Corporation, Subsidiaries 9
United States Steel Export Co. 9
Universal Clay Products Co. 124

Vanadium Corporation of America 47

Webster Manufacturing, Inc. 202
Westover Corporation, Nomad Equipment Division 192
Wheelabrator Corporation 2, 154, 206
Whirl-Air-Flow 199
Whitehead Brothers Co. 37
Wickes Corporation, The, The United States Graphite Co., Division 141
Woodward Iron Co. 195

Classified Advertising
....213, 214, 215, 216, 217, 218, 219, 220



Amazing one-day service with new Accoloy Kuplex Slings

• The man to see for really speedy service on your sling chain orders is your nearby Authorized KUPLEX distributor. Within 24 hours, he can supply you with ACCOLOY KUPLEX Sling Chains assembled locally from matched components which have been designed and manufactured for use with all other KUPLEX parts. Matched KUPLEX components are made to ACCO *Registered* specifications from heat-treated ACCOLOY steel, and are factory proof-tested at twice working load limits to assure their being as strong as the chain itself. These facts are attested to in a Certificate of Test issued by ACCO and signed by the distributor who assembles and sells you complete KUPLEX sling chain assemblies.

If it's factory-built slings you desire, he can also supply you with ACCO *Registered* Sling Chains.

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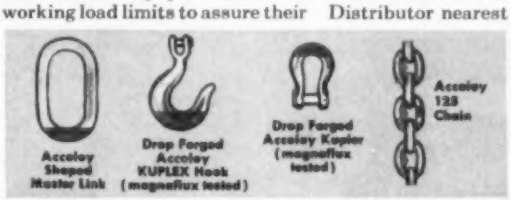
Write our York, Pa., office for the name of the Authorized KUPLEX Sling Chain Distributor nearest to you.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Drop Forged Accoloy KUPLEX Hook (magnaflux tested)
Drop Forged Accoloy Kaplex (magnaflux tested)
Accoloy 125 Chain

6 CHAIN SIZES with these **4** COMPONENTS

• A nearby Authorized ACCOLOY KUPLEX Sling Distributor can furnish promptly from his stock the exact sling chains for your specific requirements; made up from above components. Six chain sizes (¼" through ⅞") are available in single, 2-leg, 3-leg or 4-leg styles.

Accoloy Kuplex Sling Chains

ACCO American Chain Division • American Chain & Cable Company, Inc.
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Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston
*Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco
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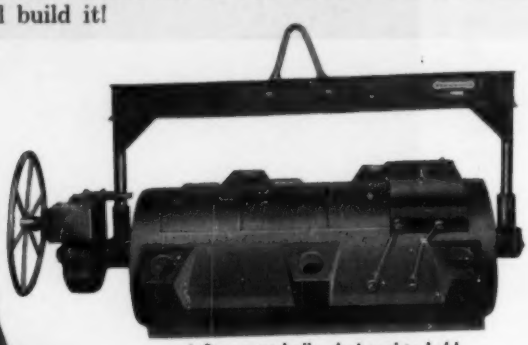
LADLES UNLIMITED

Wherever metal is treated, inoculated, distributed or poured — MECHANICALLY — the chances are good that the ladle equipment is MODERN! Ladles in all types and sizes are engineered to the metal loads and pouring conditions. There are no size limitations: You name it! We'll build it!

800 pound, straight-sided ladle with square bail and gearing. Seven standard gear sizes are available for ladles to serve the expanding range of tilting needs.

Modern 17½" top diameter, tapered, covered ladle with No. 1 type shank, roller bearing trunnions and detachable bail.



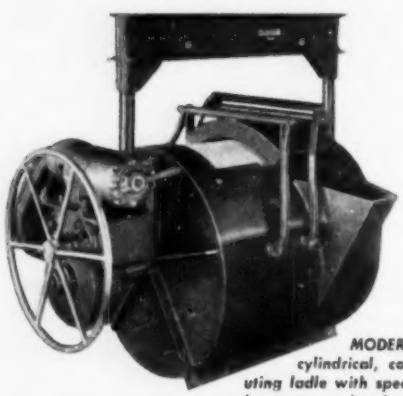
A five-spout ladle, designed to hold 1500 pounds, pours from either side.

Pete—
I believe we should order a couple new ladles now! See me!
B.K.

82" diameter ladle having 50,000 pounds metal capacity and built to steel mill specifications.

Obround mixing ladle of 36,000 pounds metal capacity.

Ask for CATALOG P-152-A



MODERN 2000 pound cylindrical, covered, distributing ladle with special bail. Tilted by motor or hand wheel.

Special inoculation ladle on transfer car. Ladle bowl is detachable.

MODERN

MODERN EQUIPMENT COMPANY

PORT WASHINGTON, WISCONSIN

(Dept. F12)

Circle 703 on Page 53

Now...
STEVECO$_2$CO$_2$ BINDER
produces castings with
• minimum internal machining
• no blow holes
• no cracks

They're building quality into this Highway Trailer with BETTER CASTINGS

Highway Trailer Company has discovered how to *build extra quality into their product starting right in the foundry. This casting, an essential component* of the big semi's landing gear, is produced better and *faster with the CO$_2$ process employing Stevens* Steveco$_2$ CO$_2$ Binder.

This is possible because Steveco$_2$ Binder provides these multiple advantages: • ideal viscosity • good flowability for maximum core density • minimum gassing requirements • easy handling and long bench life of the sand • better collapsibility • higher compression strength and scratch hardness • plus smoother, near-finished castings.

Learn how you too can gain these benefits essential to a better product, produced at lower cost. To see its amazing results try Steveco$_2$ in your foundry today!

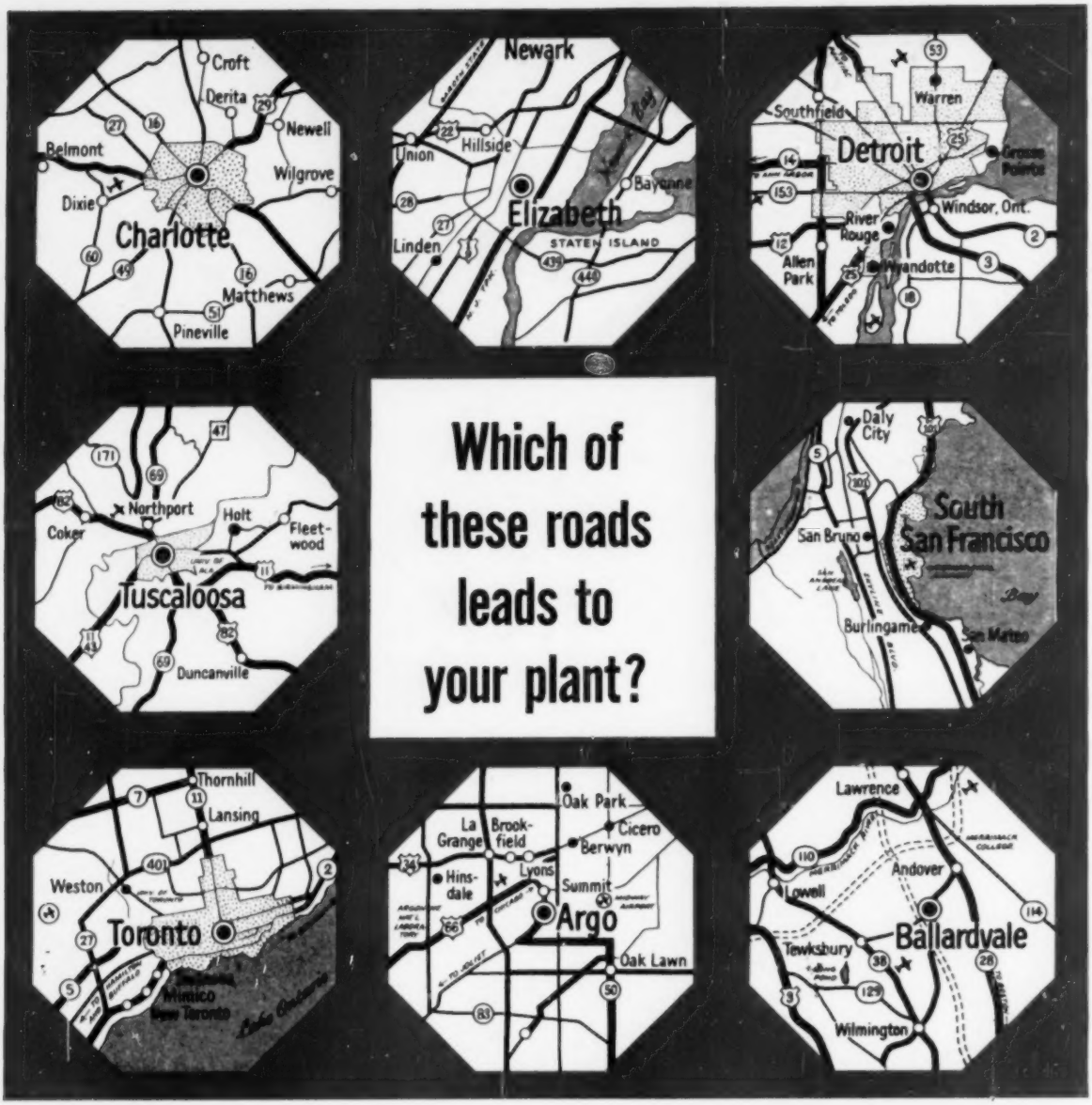
frederic b. **STEVENS, inc.**

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
INDIANAPOLIS MILWAUKEE NEW HAVEN SPRINGFIELD (OHIO)

EVERYTHING FOR A FOUNDRY

Circle 552 on Page 53



Get fast delivery of quality foundry binders from RCI

Is fast, dependable delivery of quality foundry binders important to your production? Reichhold now ships from eight strategically located plants and/or bulk storage points – more than any other producer. The plants are located at: Charlotte, N. C.; Elizabeth, N. J.; Detroit, Mich.; Tuscaloosa, Ala.; So. San Francisco, Calif.; Ballardvale, Mass.; Toronto, Ont. (Reichhold Chemicals, [Canada] Ltd.); bulk storage facilities at: Argo, Ill.

Equally important, Reichhold's experience in the foundry resin field is an assurance that RCI phenolics and amino-aldehydes can satisfy any of your core sand mixture requirements.

Why not contact your Reichhold representative for more information on RCI foundry products.

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N.Y.

Circle 553 on Page 53

REICHHOLD

Creative Chemistry . . . Your Partner in Progress

RCI

FOUNDRY PRODUCTS

FOUNDREZ – Synthetic Resin Binders
coRCImet – Core Oils
COROVIT – Self-curing Binders